[ESTABLISHED 1832]

THE OLDEST RAILROAD JOURNAL IN THE WORLD

AMERICAN ENGINEER AND RAILROAD JOURNAL.

PUBLISHED MONTHLY
BY
R. M. VAN ARSDALE, INC.
140 NASSAU STREET, NEW YORK

J. S. BONSALL, Vice-President and General Manager

Editors:
E. A. AVERILL. R. H. ROGERS

DECEMBER, 1911

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CONTENTS

Service of Mallet Articulate Locomotives	461
Oxy-Acetylene Welding	466
Increased Use of Oil on Railroads	466
Two Useful Special Devices. By Chas. Markle	467*
New Electric System of Cab Signalling	468*
Test of Mallet Locomotives Equipped with Superheater and Brick Arch, New York Central Lines	471*
Safety Plan on the Baltimore & Ohio Railroad	474
Motor Driving for Planers	475*
Train Lighting Instruction Car, Pennsylvania Railroad	475
2-8-2 Type Locomotives, Southern Railway	476*
Maintenance and Operation of Locomotive Superheaters	477
Announcement	478
Economy vs. Capacity	478
Philosophy of Engine Failures	479
Flexible Metallic Roof for Box Cars	480*
Locomotive Fire Fighting Apparatus	482
Cincinnati Slow Speed Planer Drive	483*
Calorized Electric Soldering Iron	483
An Interesting Sectional Driving Box	483*
Overhead Grease Feed for Journal Box	485*
Newly Designed Radial Drill	486*
Air Press for Rod Bushing	487*
Electric Power for Railway Shops	488
Four Spindle Staybolt Drill	489
Proposed Specifications for Postal Cars	490
Automatic Controllers for Motor Driven Machinery	492*
An Unique Steel Storage Bin	493*
Variable Lead Attachment for Radial Valve Gears	494*
High Production Cold Metal Steel	495*
New Cabinet Turret Lathe with Friction Geared Head	496*
Machine for Cutting Square Holes	497*
The Railroad Clubs—Reports of Proceedings	498
Personals and Catalogues	499
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ECONOMY VS. CAPACITY

Much is heard about this device saving 10 per cent., that one 14 per cent. and the other 30 per cent. in fuel, cost of repairs, etc., and accurate tests are produced to show the validity of the claims. There is no doubt but what these results are correct and reliable, but is this saving in fuel or repairs the vital feature which will determine the use of the different appliances or designs? It is the desire of a railway company to transport loaded cars from one point to another at the lowest cost per ton-mile consistent with good service. It is well known that this in most cases can be attained best by the heaviest trains operated at a fair speed, and while no one has any objections to saving 5 tons of coal per trip, the general balance sheet will be improved more by hauling 5 extra cars per trip.

While, of course, there are some locomotives operating below 100 per cent. capacity, which will not show results in this way, they are probably too few to be worthy of consideration and in most cases the capacity is so frequently exceeded that the item of over-time becomes serious. What is really wanted by railways from new locomotive designs, superheaters, brick arches, stokers, etc., is more ton-miles per hour over the division, more cars hauled at the same speed or the usual train hauled at a higher speed, and the value of these improvements to a railway company in a great majority of cases lies in their qualities as capacity increases and not as fuel savers. It is not that so many less tons of coal are burned, but that so many more cars are hauled per ton that counts.

In the tests on the New York Central Lines, which are given in this issue, very gratifying economies are shown by the Mallets over the consolidations, and while these are very pleasing, the fact that 1,400 cars can be transported over the division in 24 hours where previously 1,000 cars was the maximum, is the one that dictated the adoption of this type of locomotive.

In this connection the recent experience of a certain railway is interesting and instructive. The company applied to some of its locomotives a device which from thoroughly reliable trials on other roads could be expected to give an economy or increased capacity of about 10 per cent. After thoroughly practical road tests covering a considerable period it was reported that the device showed an economy of 35 per cent. in coal consumption under the same conditions as other locomotives not so equipped. Unquestionable figures were presented by the company's local officials verifying these results.

This was so surprising that a detailed investigation was made by those interested and it was found that while the device in itself was giving about the expected economy, the remaining 25 per cent. was obtained by simple changes in the arrangement and adjustment of the locomotive which has been recommended by the expert applying the device.

This is by no means an unusual occurrence and explains to some extent why some appliances do not give as good results on some roads as on others where conditions seem to be very similar. Beyond doubt there are many locomotives now in use

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which are burning from 15 to 25 per cent. more fuel than is necessary for the work they do or are doing from 25 to 30 per cent. less work than they are capable of.

How many master mechanics are sure that there is a sufficient air opening into the ash pan of their locomotives? How many know that the most economical relation of valve setting and size of exhaust nozzle are being used? How many have experimented to find the best design of grate bars for the particular power on their division? How many are sure they have the best relation of stack and size and shape of exhaust nozzle?

These things and many other similar comparatively simple changes will make a great difference in the capacity of the locomotive and it should not be left for the experts of the supply companies to inform the motive power man on his own business.

THE PHILOSOPHY OF ENGINE FAILURES

A recent paper read before the Northern Railway Club, which is briefly reviewed elsewhere in this issue, infuses new life in the old question of engine failures, the bugbear of motive power departments generally, and the true worm which never dies. Nothing of particular value was evolved from this discussion, because it proceeded in accordance with the conventional lines whereupon each of the several departments cast its blame elsewhere while individually excusing themselves. The entire proposition simply resolves into a confirmation of what all of us with actual experience have known long ago, that the general plan employed in dealing with this objectional but none the less inseparable feature of railroad operation is unquestionably unfair, and with the mechanical department always in the star role as the scapegoat.

This latter statement is not intended to imply that this department is intentionally placed in this position by its more influential collaborator in the general scheme, or, in other words, that of transportation or operating, but adherence to time-honored procedure naturally brings this about. When a mishap does occur in connection with the locomotive while on the road it is not reported by the engineer to the master mechanic, but by the conductor to the superintendent or train despatcher. In a great number of instances the conductor endeavors to obtain the real facts, but in many others he fails to do so, either through lack of the energy required to walk up to the head end of the train, or through a lack of realization of what the importance of a true report means to the motive power department, which will eventually receive it *via* that of the operating.

In consequence the reports which appear on the daily engine failure sheet sent by the superintendent to the master mechanic such information is often entirely misleading, and results in prolonged correspondence over an incident which may have never occurred, or, if it did, nothing in extent or gravity to that given the dispatcher.

The manifest unfairness of the procedure as ordinarily employed may be attested to through the following instance: A passenger train was delayed at a certain point by what was nothing more than a slow working train crew. In the meantime the engineer, who had observed before leaving the initial point of the run that a pipe clamp was loose under the running board, concluded that it might be to the point, in view that there was nothing else to do but wait on the conductor, to tighten it up. About the time, however, that he put his wrench on the nut the train crew had completed their work and were ready to start, but the conductor, observing the engineer to be at this tinkering, and knowing himself to be four minutes late through his own slow work, delayed giving the starting signal until the engineer had leisurely completed repairs which might as well have been entirely omitted as not.

In consequence the conductor wired, "Delayed six minutes account of engineer working on engine," and thus it so appeared on the engine failure sheet the next day. The fact that the engineer took occasion at that particular time to repair a trifling defect placed the conductor in a position to ascribe the entire delay thereto, and naturally, knowing himself to be at fault, was quick to take advantage of it.

In the subsequent explanation which the master mechanic was, of course, called upon to make, he could not dispute that the clamp was tightened, and he was not in a position to go into sufficient detail to demonstrate that it was practically unnecessary work. Hence an engine failure was recorded against his division, and incidentally a black mark against the entire motive power department.

This is a true incident, and every master mechanic in railroad service can recall its counterpart. They know that it is wrong; that the conductor's statement is untrue, but being so heavily harassed with other matters, they are unable to devote the necessary time to a full investigation which would develop the real facts and expose the prevarication.

A well-remembered incident in connection with such misinformation occurred recently on a prominent New England railroad, which, as further illustrative, is worth repetition. This was at a point where a fast express train was scheduled to stop five minutes for water and to permit a dining car to be removed. Water was taken in three minutes, and so far as the engineer was concerned, he was ready to go. The diner was detached within its stipulated time, and the start might have been made on time had it not been for the fact that the conductor, not expecting such celerity of movement, failed to keep up his own end and was not in a position to pull out.

At this unfortunate psychological moment, for the master mechanic and motive power department the engineer was observed up front giving a parting twist to a main pin grease plug. On observing the signal the runner jumped immediately into the cab and started, as he could have done three minutes before had the conductor been ready, but the latter nevertheless explained the delay by "waiting on the engineer."

Of course, the engineer indignantly explained to the master mechanic the error of the report and the manifest subterfuge of the conductor, but, on this road at least, without avail in eradicating the supposed engine failure from the sheet.

In addition to the above mentioned common instances of where the motive power department gets the worst of it may be cited what frequently transpires on freight trains; that is, when an actual engine failure does occur at a point where considerable work is to be done, all of the delay is assigned to the engine. To illustrate, an engine lost a rod key and ten minutes was spent by the engineer in trimming up a piece of wood to drive into the slot in lieu thereof. In the meantime, however, considerable bungling had resulted on the caboose end of the train in spotting some cars on a wrong siding, making it necessary to extricate them therefrom to the position designated on the way bills. This resulted in a total delay of forty minutes, of which ten should have been charged to the engine and thirty to the train crew, but of course the master mechanic read next morning that train so and so had been detained at X forty minutes by "engineer working on engine."

It is absolutely necessary that railroads follow the question of engine failures with the regard which they do. Practically all have agreed that even a delay of but two minutes to a fast train must be explained, and this is essentially right through the moral effect produced. It needs little consideration to decide how quickly discipline would become relaxed and efficiency impaired without this eternal prodding, but it is particularly unfortunate, as has been before shown, that the reports are too often misleading.

Engines fail, and will fail, as long as the scheme of steam railroading exists, and only eternal vigilance will hold them to the minimum, but the burden of censure following such is not evenly distributed. In the main it should rest upon the motive power end of it, but the latter should have the benefit of all possible doubt. There should absolutely be a check on all conductor's reports, and it will be found that the inauguration of a plan to accomplish this will relieve much of the friction which it cannot be denied exists between the office of master mechanic and that of division superintendent arising from these errors.

FLEXIBLE METALLIC ROOF FOR BOX CARS

With the possible exception of the draft gear and its attachments, there is probably no one part of the box car that is a source of so much trouble and expense as the roof. The conditions to be met by the roof on a box car, particularly on one of all-wood construction that has been in service some time, are very difficult and many different schemes have been proposed to meet them. Some of these have proven to be very successful under ordinary conditions, and others, while seeming to be capable of fulfilling the conditions, have not satisfactorily stood the test of practice. Perfect flexibility in all directions is an absolute requisite of a successful box car roof, but combined with this, it must also possess great durability, be capable of successfully withstanding mechanical injury and come within reasonable limits as to weight and cost.

A new type of roof, which it is believed fulfils all of these conditions and has added advantages in connection with an improved attachment for running board and reduced clearances, has been designed by the Franklin Railway Supply Co., 30 Church street, New York City. Roofs of this design have been in service in sufficient quantities and for a sufficient length of time under different conditions to indicate that the expectations of the designers are being fulfilled.

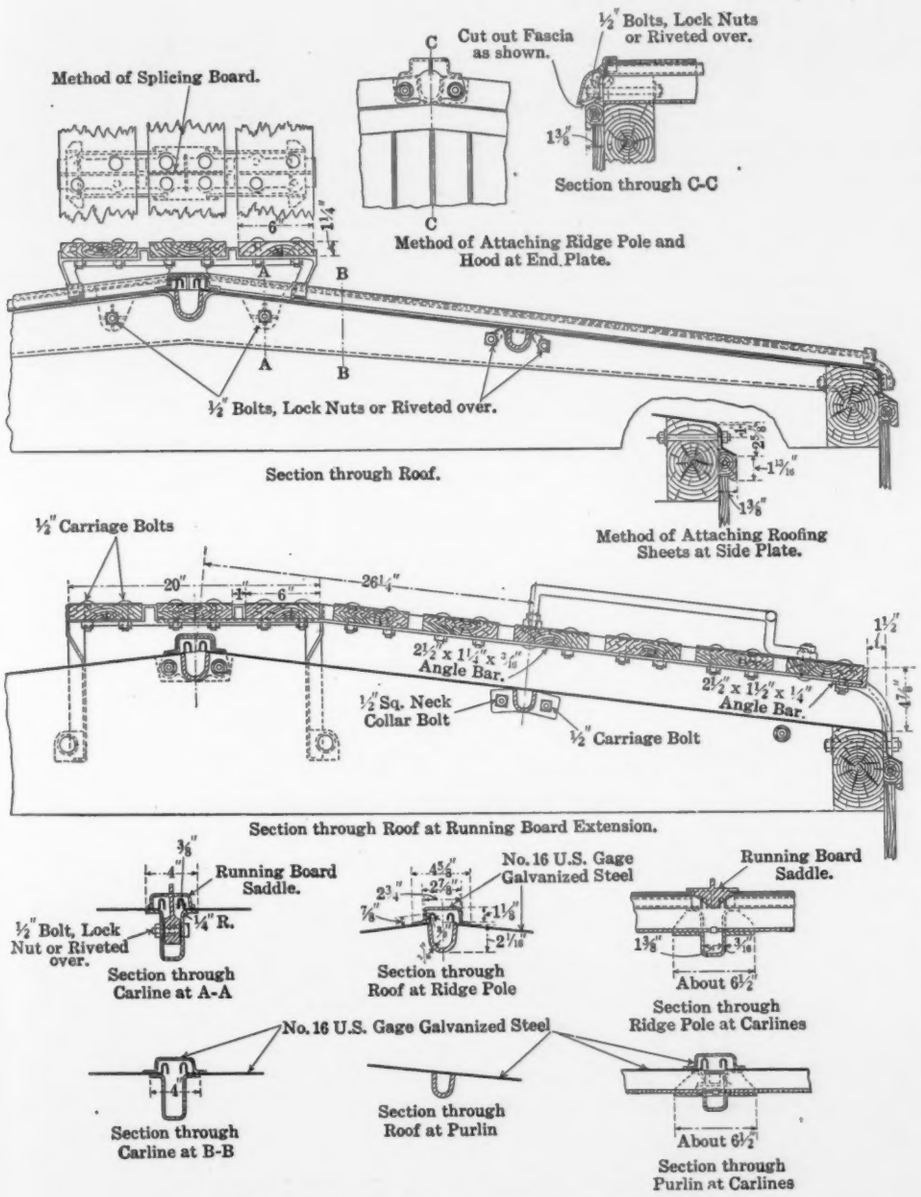
This roof is being furnished in two designs, one comprising the whole roof, including purlines, carlines, ridge pole, running board and all attachments, which is called the all-steel type, and the other, called the outside type, is arranged for application over the present roof, which may have any style or arrangement of members. An essential feature in both designs is that the running board and all weight coming upon it are supported entirely and directly from the carlines. This construction is arranged to fulfil every requirement of the new safety appliance law.

INTERIOR OF CAR FITTED WITH THE ALL-STEEL TYPE OF FRANKLIN FLEXIBLE ROOF.

The general basis of the design is the forming of the roof of a series of independent galvanized steel plates 1/16 inch thick each of a size to cover the area between carlines and from the ridge pole to the side plate. The edges of these sheets at the sides and ends of the car are turned down over the side and end plates. The sides which are adjacent to the carlines and ridge pole have their edges turned up and then turned down, extending slightly below the level of the carlines and ridge pole, as shown in the illustrations. The sheets are secured by bolts at the plates, but are otherwise entirely free to move relative to each other and the adjoining edges of the sheets are separated a sufficient distance to permit this free movement. No attempt is made to form a water-tight joint at these points and the carlines and ridge pole are made in "U" section and arranged to

THIS CLEARLY SHOWS THE REDUCED CLEARANCE AT THE EAVES GIVEN BY THE FRANKLIN FLEXIBLE ROOF

form a gutter for carrying off any water which may work its way up and over the upturned edges of the roofing sheets. Over the gaps between the sheets there is a cap which prevents any direct entrance of water to the joint. This cap, while holding the sheets in place, is not secured to them and does not interfere with their relative movement. It is held in place at its outer end by being inserted in a pocket in the malleable iron carline hood and at the inside end by pockets in the running board saddle. A similar cap over the ridge pole is secured by being inserted in pockets in the running board brackets. The carlines and ridge pole are carried through the side and end plates which are gained to receive them. The ends of the carlines are turned down and they are fastened by two horizontal


Method of Splicing Board.
Cut out Fascia as shown.
½" Bolts, Lock Nuts or Riveted over.
Section through C-C
Method of Attaching Ridge Pole and Hood at End Plate.
½" Bolts, Lock Nuts or Riveted over.
Section through Roof.
Method of Attaching Roofing Sheets at Side Plate.
½" Carriage Bolts
Angle Bar.
½" Sq. Neck Collar Bolt
½" Carriage Bolt
Angle Bar.
Section through Roof at Running Board Extension.
Running Board Saddle.
½" Bolt, Lock Nut or Riveted over.
¼" R.
Section through Carline at A-A
No. 16 U.S. Gage Galvanized Steel
Section through Roof at Ridge Pole
Running Board Saddle.
About 6½
Section through Ridge Pole at Carlines
No. 16 U.S. Gage Galvanized Steel
Section through Carline at B-B
Section through Roof at Purlin
About 6½
Section through Purlin at Carlines

FRANKLIN FLEXIBLE CAR ROOF—ALL-STEEL TYPE.

square-necked collar bolts passing through this downturned projection and the side plates of the car. These same bolts hold the malleable iron carline hood which is arranged to prevent the entrance of dirt and cinders, but to permit the exit of water from the carlines and also hold in place the carline caps as mentioned above. The arrangement at this point is such as to give a minimum car clearance at the eaves. The fascia boards project beyond the ends of the carline and the carline hoods, thus protecting them from being broken by projecting obstacles. Rolled steel bars "U"-shaped in section form the ridge pole and purlines. They pass over the carlines through depressed sections, thus placing their upper edges on the same plane as the top edges of the carlines. A hole is placed at the bottom of the ridge pole and purlines where they intersect the carlines, forming a drain from these members to the carlines. It will be noted that there is no joint between the roof sheets at the purlines and these are made in "U" sections simply for strength. A key is provided securing the purlines to the carlines at each junction, which not only acts as an anchor at that point, but greatly strengthens the structure.

One of the most interesting and important features of the design is the construction and arrangement of the running board saddles. These are of malleable iron and are arranged for 6-inch boards fastened by carriage bolts. The top horizontal bar is provided with projecting lugs at the ends and between the boards forming a pocket for them to set in and small corner projections are provided which enter the boards at their edges, thus preventing them from shifting endwise. Suitable pockets for receiving the ends of the carline caps are arranged and this casting forms the cap over the joint underneath the running board, similar pockets are also arranged for receiving the ridge caps. From the under side of the saddles extend lugs which fit into the "U"-shaped carline in the all-steel type and are secured by two horizontal bolts. This not only insures that the weight will be transmitted to the carline, but also that there will be a fixed distance between the running board saddle and the carline so that the roof sheets cannot become bound or pinched at this point. From the under side of the saddles there is a web extending down at the center engaging the top edges of the ridge pole, thus holding it in place.

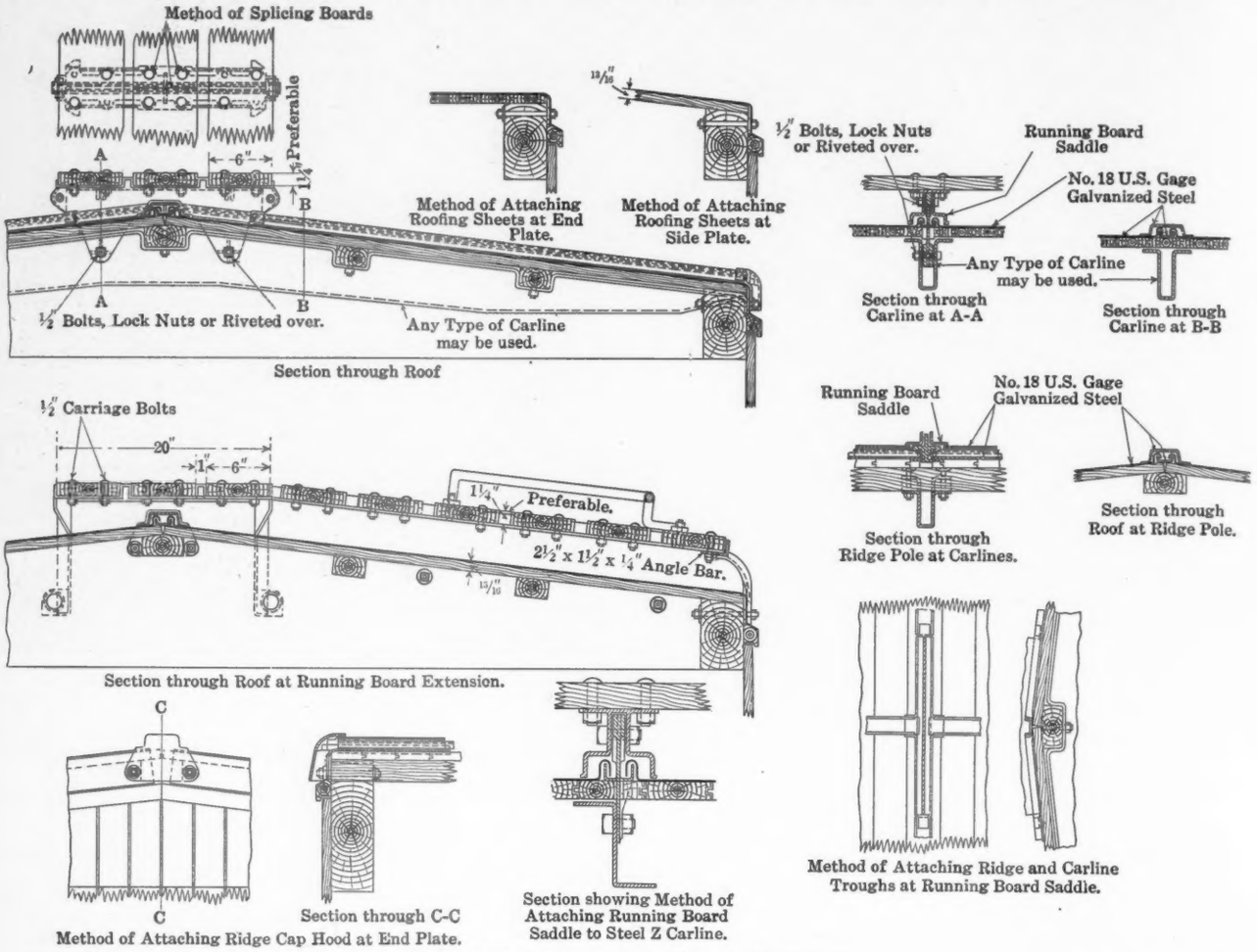
At the ends of the ridge pole there are malleable iron hoods similar to those at the ends of the carline and the ridge pole is turned down over the end plate in the same manner.

Malleable iron brackets carry the running board extensions at the ends of the car. These are arranged with the lip at the outer end coming up flush with the ends of the boards, thus protecting them and preventing any endwise shifting. The running board side extension is carried on angle bars with the vertical leg upward, which are secured by being bolted to the running board and by a malleable iron support at the corner of the car.

With the outside type of roof, the carlines, ridge pole and purlines may be of any kind and the roofing sheets are laid directly upon the roofing boards, but are not secured to them. The construction of the upturned edges is altered somewhat to permit a trough being inserted for performing the same function as the carlines in the all-steel type. The roofing sheets are secured to the side and end plates in same manner as before and the carline and ridge caps are the same style. The running board brackets and saddles are very similar to the all-steel design and are carried through and connected to the carlines in the same general manner,, insuring that no weight from this source shall be transmitted to the roofing sheets.

In both cases, all parts of the roof which is exposed to the atmosphere are thoroughly galvanized, and as the air can circulate freely through the carline and ridge caps, no excessive corrosion can occur.

Both of these types can be applied by the usual labor employed on this class of work, and on account of the small number of parts and the method of locking the roof members together, the amount of labor to apply the roof is greatly reduced. The total weight of the all-metal type of roof is about 2,500 lbs., the outside type, of course, being very much lighter.


Method of Splicing Boards
Preferable
6"
A
B
Method of Attaching Roofing Sheets at End Plate.
Method of Attaching Roofing Sheets at Side Plate.
½" Bolts, Lock Nuts or Riveted over.
Any Type of Carline may be used.
Section through Roof
½" Carriage Bolts
20"
1"
6"
1¼" Preferable.
2½" x 1½" x ¼" Angle Bar.
Section through Roof at Running Board Extension.
C
Method of Attaching Ridge Cap Hood at End Plate.
Section through C-C
Section showing Method of Attaching Running Board Saddle to Steel Z Carline.
½" Bolts, Lock Nuts or Riveted over.
Running Board Saddle
No. 18 U.S. Gage Galvanized Steel
Any Type of Carline may be used.
Section through Carline at A-A
Section through Carline at B-B
Running Board Saddle
No. 18 U.S. Gage Galvanized Steel
Section through Ridge Pole at Carlines.
Section through Roof at Ridge Pole.
Method of Attaching Ridge and Carline Troughs at Running Board Saddle.

FRANKLIN FLEXIBLE CAR ROOF—OUTSIDE TYPE.

RECOVERY OF TIN FROM TIN SCRAP, used tin cans, old tin pipe, worn driving-box linings, drosses, old solder, bronze sweepings, etc., in the United States is increasing. From these materials the recovery of tin is commonplace and expected except from used tin cans; in them the loss of tin is enormous. The tin recovered during 1909 as tin amounted to 2,423 tons; in the form of alloys, such as solder, babbitt metal, bronze, etc., 3,092 tons; a total of 5,515 tons, equal to more than one-ninth of the tin imported into the United States and worth $3,281,425. Besides the money value involved, the world's tin resources were increased by so much—a very real conservation.

THE LONGEST METAL SHAVING.—W. B. Duff, a machinist, claims to have broken the world's record by making the longest shaving ever produced. While turning down a piece of vanadium steel, he cut out a spiral sliver that measured 121 feet in length. Shortly after getting this remarkable result, he cut another shaving that measured 155 feet. The best previous record ever reported was from the Santa Fe Railroad shops at Topeka, where a shaving of 110 feet was turned out.

LOCOMOTIVE FIRE FIGHTING APPARATUS

W. R. Barton, fire prevention inspector of the Missouri Pacific-Iron Mountain, has studied out a fire fighting apparatus which can be attached to railroad locomotives and effectively employed in preventing conflagrations near the tracks. A recent test made at the Ewing Avenue shops of the Missouri Pacific in St. Louis was witnessed by the fire chiefs of that city, and their endorsement of the appliance was such that the railroad has decided to equip all yard engines on the entire system with it and also a number of road locomotives.

The tanks of the large yard engines hold 6,000 gallons of water. Barton's plan is to carry 50 ft. of 1¼-inch steam hose on a reel under the running board of the engine. Steam hose is used, as the water which comes from the tank and is forced through the branch pipe is very hot, and in a short time would destroy the ordinary rubber hose. The connection is placed on the branch pipe between the boiler check and injector. The idea is that when an engine reaches the scene of a fire in the yards a switchman is to jerk the hose from the reel and attach it to the coupling leading from the branch pipe, and the engineer is to start the injector, while the fireman goes out on the running board and opens the valve in the branch pipe leading to the boiler check. The stream of water can then be turned on the conflagration.

THE PRESERVATION OF IRON IN CONCRETE is again demonstrated in the demolition of an old gasometer in Hamburg, Germany. This structure was built about 1852, and when taken down forty-eight years later, the iron anchor bolts which had been completely encased in a cement concrete were found to be as fresh and bright as new iron, with no traces whatsoever of rust.

CINCINNATI SLOW SPEED PLANER DRIVE

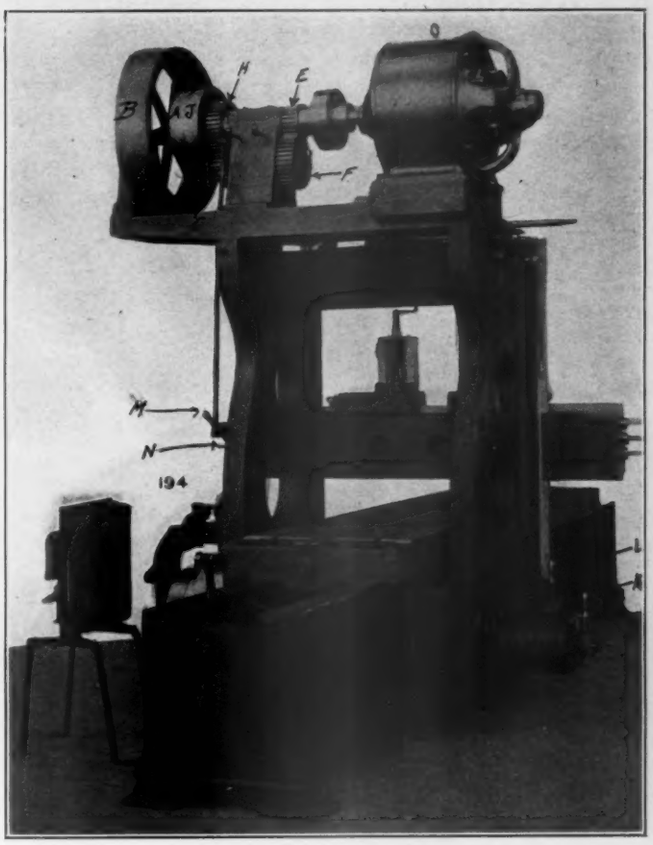
A very interesting slow speed arrangement as applied by the Cincinnati Planer Co. to a 36-in. machine is clearly shown in the accompanying illustrations. This additional feature is attained through gears in connection with an electric variable speed drive, and was developed through a realization that a slow speed must be employed in machining extremely hard castings. These slow speeds are also quite applicable to work of irregular shape or wide surfaces which are finished by a form tool.

The planer is driven by a 2 to 1 variable speed motor directly coupled to the top shaft, which runs in ring oiled bronze bushed bearings and carries the regular cut and return pulleys (A) and (B) which are keyed to the shaft. The cutting and return speeds are changed by setting the handles shown at (C) and (D) to any predetermined speed. The drive, so far as described, constitutes the regular arrangement, giving cutting speeds of 27 to 54 feet per minute and return speeds of 75 to 150 feet. Any combination of these may also be obtained; for instance, it is possible to run forward on the cutting stroke at 27 ft., and return at 150 ft., or cut at 40 and return at 100 ft. per minute, and again the return may be left set at 100 ft. and only the cutting stroke varied. These changes can be made instantly while the machine is idle or while running on either stroke.

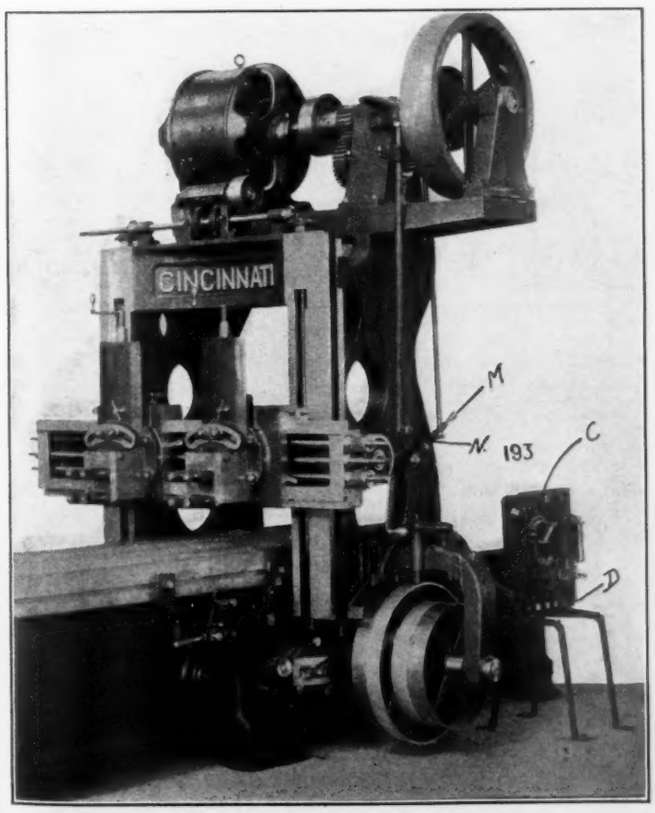
The special slow speed is obtained through the back gears on the top and the gear on the left-hand housing. Referring to the illustration, it will be seen that the pinion (E) is keyed fast to the top shaft and engages with gear (F), which is keyed to the back gear shaft with pinion (G). This pinion meshes with gear (H), which is keyed tight to the hub of pulley (J), the latter being loose on the top shaft. By moving handle (N) the cutting belt from pulley (A) to (J), giving a slow speed to the pulley on the planer, and then a further speed reduction is made through the back gears on the left side to the regular gear train in the bed. This gives cutting speeds of 1.6 ft. to 3.2 ft. per minute.

To change this planer from the slow to the regular speeds it is only necessary to disengage the back gear handle (K) and reverse the clutch handle (L). The before mentioned handle (N) then being used to return the belt from pulley (J) to pulley (A). If the planer is going to be used on the regular speeds for any length of time the back gears (F) and (G) may be disengaged, handle (M) being provided for this purpose.

The whole makes a very flexible arrangement, giving cutting speeds of from 1.6 to 3.2 ft., or from 15 to 54 ft. per minute.



REAR VIEW OF PLANER.



CUTTING AND RETURN SPEED ADJUSTMENT.

CALORIZED ELECTRIC SOLDERING IRON

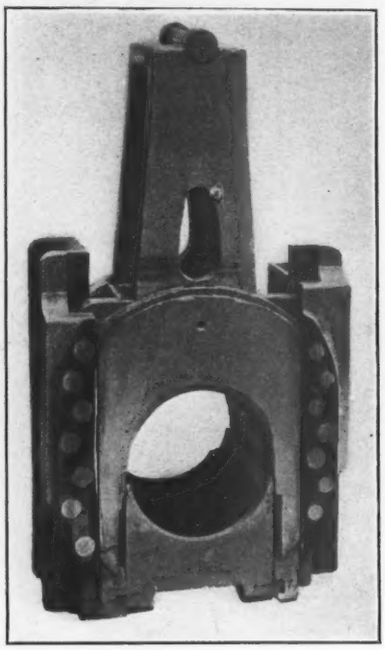
The use of the ordinary soldering iron has two serious drawbacks—the impossibility of keeping it hot continuously, and the rapid wasting away of the copper. The development of the electric soldering iron obviated the former, furnishing the mechanic with an iron which not only stayed uniformly hot all the time, but one in which the heat intensity could be easily regulated by the mere turning on or off of the current. The second fault, that is, the rapid wasting away of the copper, still remained, to a large extent, necessitating frequent renewals, and consequently making no reduction in the cost of maintenance.

It is of much interest to metal workers to know that many experiments made in the research laboratories of the General Electric Company to mitigate this fault has resulted in the discovery of a process of treating the copper which renders the latter non-oxidizable under high heats and non-corrodable by the acids used in soldering. Furthermore, it reduces to a minimum the dissolving action of the molten tin, with which the working tip must always be kept coated. This "calorizing" process or method of treatment does not merely coat the surface of the copper with a thin layer of non-oxidizable or non-corrodable substance, liable to scale off under the effects of heat and acids, but actually changes the characteristics of the copper to an appreciable depth. Thus the durability or practical working life of the copper is increased to such an extent as to provide a soldering iron of maximum economy and effectiveness.

The tool is a very interesting development of a well-known principle and apparently has been worked out thoroughly and effectively.

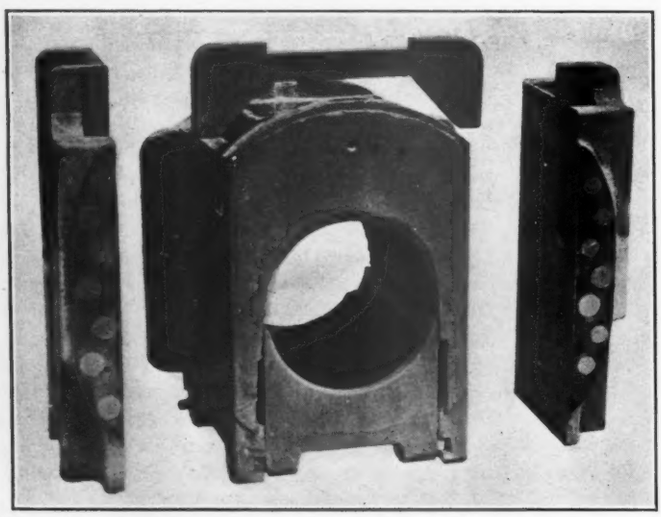
AN INTERESTING SECTIONAL DRIVING BOX

The rapidly increasing size of locomotives with the addition and redesign of the accompanying parts, especially those under the engine, made necessary by new wheel arrangements with underhung spring rigging, and many other details which were unknown only a few years ago, have converted the maintenance of driving boxes into a very serious problem through the po-



ASSEMBLED DRIVING BOX.

sition of inaccessibility which this part now occupies. Drop pit work heretofore was not as a rule regarded as a particularly serious proposition in connection with roundhouse operations. In the majority of instances, with the exception of the main wheels, it became only necessary to take down the binder, and such of the side rods which might conflict, whereupon the subsequent procedure of lowering the wheel was simple, and in



BOX, SHOE, WEDGE AND KEY.

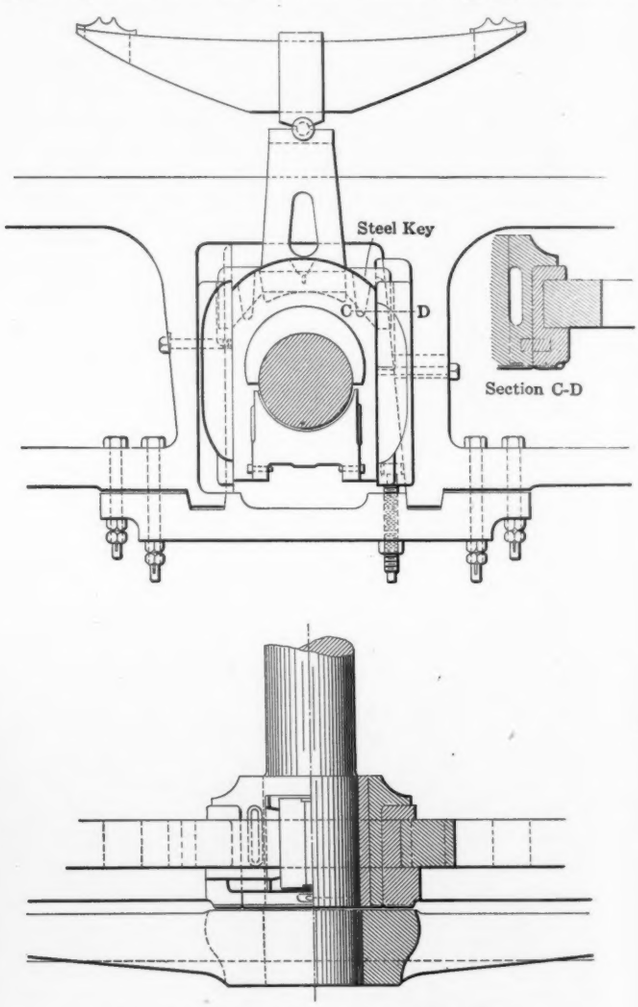
fact the entire job could be performed with comparatively little delay to the road time of the engine.

Recent complications, however, with the vastly augmented weight of the component parts have in many instances converted this undertaking into one of rather formidable proportions, and so prolonged the work that it is not unusual to see a locomotive held for two or even three days for the renewal of a driving box brass, or even a shoe and wedge.

With a full appreciation of these facts it is not surprising that the efforts of many clever mechanicians have for some time been directed toward securing some new form of driving box construction which would permit its removal without any recourse to the drop pit whatever, and without the general dismantling process which has become so prominently associated with it.

A recent device to this end which embodies many novel and decidedly interesting features has been recently patented and is now being tried out with satisfactory results on the Galveston, Harrisburg and San Antonio Ry. The construction of this, what may be called sectional driving box, can be readily understood from the accompanying illustrations. It permits the removal of the box, shoe and wedge, without the use of a drop pit or crane, and the labor of taking down and replacing connecting rods, pedestal binder, brake rigging, wheels, etc., is saved, the locomotive being out of service only a few hours.

It will be noted from the half-tone illustrations showing the separate parts of the box, and the entire arrangement in its as-



LOCOMOTIVE PEDESTAL WITH BOX APPLIED.

sembled form, that the former are held securely together by the use of a heavy steel key which unites the box, shoe and wedge on the side of the frame next to the driving wheel. To remove the driving box from the locomotive all required is to take the weight off the spring or equalizer, shift the saddle or equalizer to one side and lift out the key, whereupon, by reason of the box being unflanged at its outer end, it can be moved inward on the axle and taken out. Then the shoe and wedge may be removed without disturbing other parts.

The shoes and wedges, by reason of being built out on the outside, are adapted to take up the lateral thrust and part of the wear of the driving wheel hub. The driving box, although having no outer flange, appears to be adapted to resist the lat-

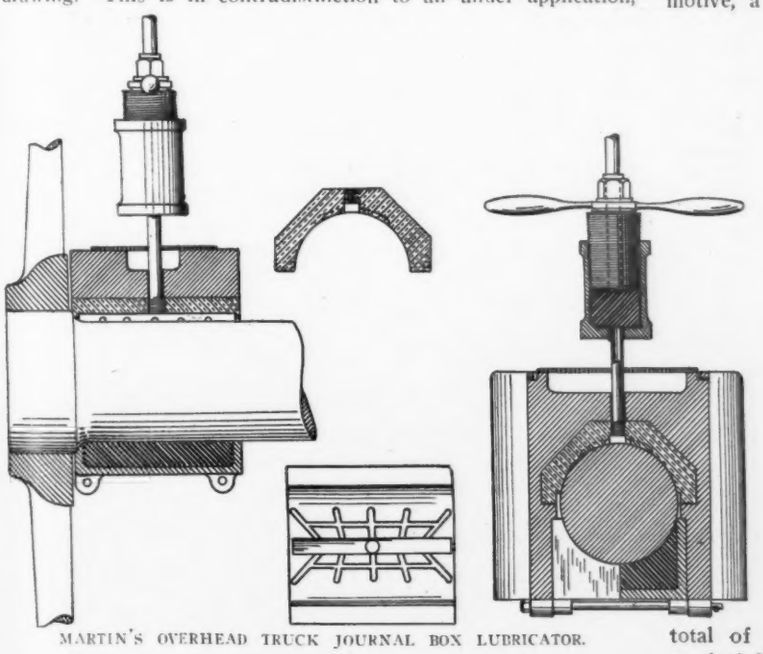
eral thrust of the driving wheel in the usual manner, this being secured by the presence of the key which prevents endwise movement of the box.

It is prominent in this construction that the wearing surface on the sides of the driving box has been increased nearly 50 per cent.; that the shoe and wedge have been materially strengthened, and that better lubrication appears possible. Wedges should not require adjustment as frequently as those generally used and frame failures will probably be reduced.

It is said that a driving box can be taken down in 30 minutes when of this design, and at a cost not to exceed 60 cents for labor, which, if the latter is accurate, represents a very considerable saving over the methods now in vogue. The device is comparatively inexpensive to apply to locomotives when undergoing general repairs. No new patterns are required, as the old shoe and wedge patterns can be built out. The machine work merely consists of planing off the outside flange of the box, and the application of but one additional member consisting of a substantial key held in place by the spring saddle or spring equalizer.

OVERHEAD GREASE FEED FOR JOURNAL BOXES

Lubrication of locomotive truck journals, working within the journal box, by means of hard grease applied from the top, is proposed by J. C. Martin, inventor of the device, in accordance with the arrangement shown in the accompanying drawing. This is in contradistinction to an under application,



MARTIN'S OVERHEAD TRUCK JOURNAL BOX LUBRICATOR.

and it is explained that owing to the weight of the locomotive it has not been found practicable to properly lubricate the journals by applying the lubricant to the under face, the weight being such as to prevent its proper distribution.

As a result it is required that frequent stops of the engine be made in order that proper attention may be given to prevent overheating. The object of the automatic overhead feed of the hard grease is to provide for adequate lubrication so long as the supply within the reservoir is maintained. It is intended through its use to dispense with these frequent stoppages, to insure against overheating, to increase the mileage for a given quantity of hard grease lubricant and in general to prolong the life of the journals.

The drawing is self-explanatory, but it might be mentioned that the plan purposes the use of solid journal bearings without babbit strips. In lieu thereof the bearing face of the brass is grooved as shown, the grooves being about 5/16 in. deep. The top of the journal box is drilled with a hole sufficiently large to clear the ½-in. pipe connection from the grease cup to the journal, this connection being screwed directly into the brass. It is recommended that the cellar be packed with dry waste, nearly full, and coated on top with hard grease, the object of the latter being to prevent taking away what has been applied from the top. The length of the ½-in. pipe is determined by whatever obstructions may intervene to the location of the lubricator. The latter, as will be clearly seen, is of the compression type and is readily operated by the cross handle.

HOISTING MAGNETS.—Two hoisting magnets handled by traveling cranes at the plant of the Inland Steel Company, near Chicago, are said to have unloaded 2,000 tons of pig iron from a steamer in 10½ working hours, while with manual labor this work requires 28 men working two days and two nights. Only the two crane operators were employed, except that at the last a few men were employed to shift the pigs within reach of the magnets. It is stated also, that at the Homestead plant of the Carnegie Steel Company two operators with electric traveling cranes equipped with hoisting magnets have done the work that formerly required 25 men.

OIL ENGINES FOR LOCOMOTIVES.—Following on the experiments of the North British Railway Company, whose locomotive engineer last year designed an electric locomotive, upon which there was a steam turbine driving a dynamo, which in turn supplied electrical energy to electric motors for driving the locomotive, a leading British Railway Company has, it is stated, given instructions for the preparation of designs for a 500 h.p. locomotive of a similar character, but using a Diesel engine for driving the dynamo instead of a steam turbine. It is reported that the results with the North British type of electric locomotive have not come up to expectations in the matter of economical working, owing to certain defects, which the use of the Diesel engine will, it is expected, remedy, and at the same time reduce the size and weight of the locomotive.

RECORD OF A PANAMA SHOVEL.—During September Steam Shovel No. 132, working in the burrow pit a Mt. Hope, excavated 42,600 cu. yds., of which 32,400 cu. yds. are classified as rock and the balance as earth. The shovel is served by three trains of about ten 10-yd. dump cars each. Delays were as follows: Mining, 3.00 hrs.; repairs, 0.45; moving shovel, 11.15; cutting out shovel, 3 times, 3.30; waiting for cars, 5.30; a total of 24 hours. Shovel was under steam 200 hours and worked 88 per cent. of that time. The average output per day was 1,704 cu. yds. place measurement.

A MAMMOTH CRANE, THE LARGEST IN THE WORLD, has been erected at Govan, Scotland, for use in the construction of large steamships. It is of the cantilever type, and is 169 feet from rail level. The jib has a total length of 270 feet and extends 169½ feet outward from the center, and can be utilized within every point of a circle 336 feet in diameter. The crane on slow gear is capable of elevating 200 tons extended 75 feet along the jib and on quick gear 100 tons at 133 feet.

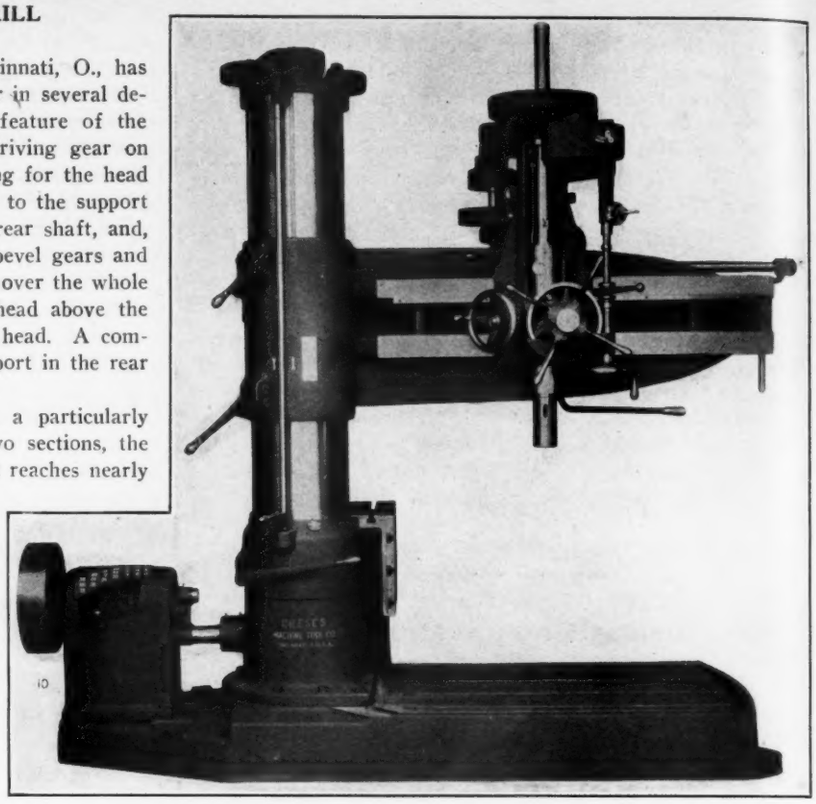
THE OXY-ACETYLENE PROCESS of cutting steel has been used in a noteworthy manner in connection with the salvage of the battleship *Maine*, the wreck of which is now being dewatered in Havana harbor. Much of the work involves the cutting of armor plate 9 inches thick, as well as the usual plates, beams and bars used in the structure of a ship.

A NEWLY DESIGNED RADIAL DRILL

The Dreses Machine Tool Company, of Cincinnati, O., has developed a line of plain radial drills which differ in several details from those formerly built. A prominent feature of the new machine is the mounting of the spindle driving gear on ball bearings, and the addition of an extra bearing for the head on the rear of the arm. This third bearing adds to the support of the head, prevents bending and strain of the rear shaft, and, still more important, minimizes the wear of the bevel gears and their bearings, and distributes the torsional strain over the whole arm. A single handle on the left side of the head above the face of the arm serves to clamp and release the head. A compound spiral gear arrangement and the third support in the rear enables it to move easily along the arm.

The general design of the machine suggests a particularly sturdy construction. The column is made in two sections, the outer one swinging on an inner fixed column that reaches nearly to the top. The diameters of both are greatly increased at the lower end. A third bearing has been introduced, which adds strength and rigidity. A place for a large roller bearing to rest and swing on is provided by the reinforced portions as well as means for clamping the column easily and firmly.

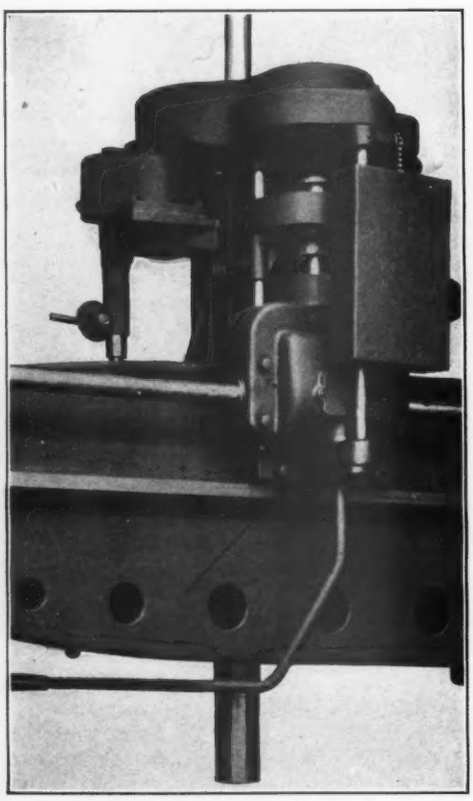
The clamping handle is always within easy reach of the operator since it follows the arm, and no pressure is exerted on the rollers of the bearing when the arm is clamped in position. These rollers are tapered, of large diameter, and thoroughly protected from chips and dirt.



THE DRESES IMPROVED RADIAL DRILL.

In the design of the spindle driving gear an important improvement has been made to reduce the friction to which this gear is subjected by the pull exerted upon it when the spindle feeds down. This has been accomplished by making the spindle driving gear rest and revolve on a ball bearing.

The mechanism for the feed, which is of the all-geared type, is enclosed in a small case. Eight changes in all are available; four of these ranging from 0.007 to 0.022 in. per revolution of the spindle are secured by the little handle on the feed shaft at the right of the head and are increased from 0.026 to 0.80 in. by the small crank above, both being within easy reach of the operator. The use of a ratchet clutch enables the hand feed to work ahead of the power feed. A swinging dog attached to an extension on the spindle sleeve is brought into contact with an adjustable dog on the feed bar, and there is a graduated scale by which the depth of a hole can be gauged from zero. Several of these dogs can be put on the feed bar and the swinging dog brought into contact with them successively for different depths of holes. A safety release for the end of the feed is provided. The quick advance and return device has four levers, any one of which engages and disengages the feed instantly, and also serves as a pilot wheel for hand operation of the spindle.



THIRD BEARING FOR HEAD.

The starting, stopping and tapping mechanism, which is of the friction type, is embodied in the head and operated by the horizontal lever shown below the arm in the illustrations. The large diameter friction bands are double expanding and are made of phosphor bronze to avoid cutting. The bevel gears containing the frictions run in an oil bath. The speed changing lever on the head enables the tap to be backed out at 2½ times the cutting speed. Three speed changes, rendering 21 different spindle speeds available, are provided for the head, the arrangement being patterned after automobile transmission gearing.

Any desired speed can be secured without stopping the machine. The speed variation is of the tumbler gear type and has seven changes. The teeth are of the 20 degree involute pointed form to insure strength and easy engagement. To overcome momentum when starting, the speed variator runs at the slowest speed at all times and is provided with the builders' self-releasing overtake clutch. In the variator one gear runs loose on the variable-speed shaft and is clutched by four pawls located in fixed gears mounted on this shaft. These pawls are kept in contact with the inner surface of the gear by spiral springs and will release the two gears when the fixed ones run faster than the loosely mounted one.

Three sizes of tool with arms 5, 6 and 7 ft. long are built and range in weight from 10,000 to 16,000 lbs. In a test of the middle size an 8-in. pipe tap was fed in a 2½-in. plate, and a hole was drilled in cast iron by a 4-in. high speed drill at a cutting speed of 100 ft. per minute and a feed of 0.027 in. per revolution of the spindle.

AIR PRESS FOR ROD BUSHINGS

CHICAGO & NORTH WESTERN RY.

A very useful contrivance for the application and removal of rod bushings is shown in the accompanying drawing. It was evolved and is in use at the Winona, Minn., shop of the above road and is said to be a great time-saver over the method formerly in vogue of doing this work on a wheel press, an improvement in fact amounting to the handling of ten bushings to one.

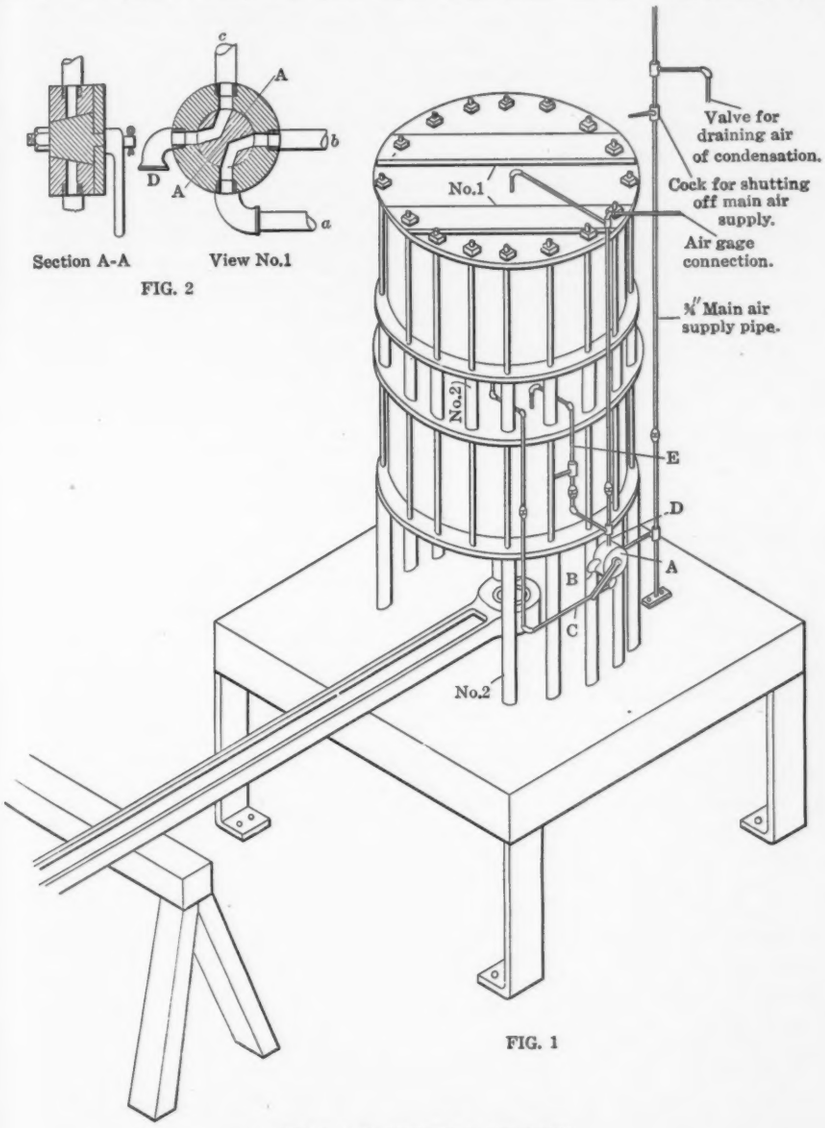


FIG. 2

FIG. 1

A CHEAP AND EFFECTIVE ROD PRESS.

It will be observed that the press consists of two cylinders. These are 21-in. diameter by 12-in. stroke, and were made from a locomotive cylinder bushing. The heads are of ½-in. boiler steel, reinforced by two 1-in. x 3½-in. pieces of flat iron. The pistons are of ½-in. boiler steel, with a collar riveted in the center which acts as a reinforcement for the piston rod, and 1½-in. angles riveted radially for additional strength. The entire contrivance is held together with sixteen one-inch bolts, as shown in Fig. 1, part of them running through the work table, and the others only to the bottom head. Pieces of pipe (No. 2) around these bolts act as separators for the cylinders and between the lower cylinder and the table.

The apparatus is controlled by the three-way valve shown at (A), Fig. 1, and in section in Fig. 2. This is made of round stick brass with a taper plug similar to a cutout cock. Holes are drilled in the body and the plug as shown. (a) connects with the top cylinder and under the piston for raising both pistons; (b) with the main supply pipe, and (c) with both cylinders on top of their pistons for pressing in the bushings. When the valve is in the position shown in Fig. 2, the main supply is connected with pipe (c), Fig. 1, and the pistons are raised, while pipe (D) is connected with the exhaust (d), Fig. 2. By placing the handle in mid position the valve is closed; in the extreme position the main supply is connected with pipe (D), Fig. 1, and pipe (c) is in connection with the exhaust.

As an index of the pressure employed a common air gauge, registering to 100 lbs., was made use of by pasting a circle of paper on the dial with the approximate tons marked opposite each ten-pound division, this ratio being easily computed as follows: the area of the two pistons = 692.72 sq. in., divided by 2,000 = .346 tons for one pound pressure, and multiplied by 10, 20, etc., gives the equivalent entirely around the dial.

This press is placed near the end of the rod department in the Winona shop and is served by a one-rail traveling air hoist.

PENNSYLVANIA'S GREAT COAL PRODUCTION.—In the combined production of anthracite and bituminous coal Pennsylvania outranks any of the coal-producing countries of the world except Great Britain and Germany, and in 1910, reports the United States Geological Survey, it came within 10,000,000 short tons, or less than 5 per cent., of the output of Germany. Pennsylvania's production in 1910 was more than four times that of Austria-Hungary in 1909, more than five times that of France in 1910, and nearly 20 per cent. of the total world production. The industry, particularly in the bituminous districts, has kept pace with the manufacturing industries and has increased in considerably larger ratio than the population of the State and of the United States as a whole. From 1814 to the close of 1910 the total production of anthracite had amounted to 2,180,323,469 short tons.

CEMENT PRODUCTION IN 1910.—Ernest F. Burchard, of the United States Geological Survey, reports that in 1910 the production of Portland cement in this country reached the enormous total of 76,549,951 barrels, with a value of $68,205,800. This is equivalent to 12,986,152 gross tons, valued at $5.25 a ton. It is an increase over the output for 1909 of 11,558,520 barrels, or nearly 18 per cent., and an increase in value of $15,347,446, or more than 29 per cent. This increase alone is greater than the total output of Portland cement in 1900. In addition to Portland cement there was also produced last year 1,139,239 barrels of natural cement and 95,951 barrels of puzzolan cement, a total of 77,785,141 barrels.

The price of Portland cement in 1910 was as low as 73 cents a barrel in some places, the average for the United States being 89.1 cents a barrel. In 1890 the average price was over $2 a barrel and as late as 1903 it was $1.24 a barrel. These figures are of considerable interest as indicative of the great demand for its product.

ELECTRIC POWER FOR RAILWAY SHOP*

There are three systems of generating current for operating shop machinery; alternating current, direct current, and a combination of both. The first modern repair shops used direct current exclusively. This was due both to lack of knowledge concerning the characteristics and uncertainty regarding the feasibility of using alternating current; also the high cost of motors and generating apparatus which then prevailed. About seven or eight years ago shops were installed using a combined alternating current and direct current system. In some cases both direct current and alternating current prime generating units were used, and direct current was obtained through the medium of a motor generator set or a rotary converter. The advantages of the latter arrangement are numerous, but the flexibility of operation and the high efficiency of large units would form a determining factor in deciding on this method in preference to the former.

During the past five years several installations have been made where alternating current is used exclusively, probably the most prominent being that of the New York, New Haven & Hartford shops at Readsville, Mass. The committee is dubious, even at this time, as to whether or not the best plan is to use alternating current to the exclusion of direct current, as no doubt exists but what increased output can be obtained from certain classes of machine tools by the use of variable speed direct current motors, in view of the present high labor costs, this is certainly an important consideration. The recent development of multi-speed alternating current motors, and the increased use of variable speed alternating current motors in conjunction with mechanical gear changes, however, may in a short time alter present engineering practice.

Practically all of the machine tool builders have so arranged their machines that the constant speed motor drive may be used through the medium of mechanical gear changes, and in small shop installations where the power plant capacity does not exceed 500 kw., it would seem inadvisable to complicate power distribution by installing both alternating and direct current, inasmuch as the relative saving in labor would be less than in a large shop where, as in a great many cases, manufacturing is done for smaller shops on the system.

In the first place, we must consider the original cost, beginning at the power plant and ending at the motors which drive the machinery. The cost of certain parts of the power plant will remain practically constant, regardless of whether or not direct or alternating current is used, provided, of course, that the same method of operating generating units is decided on. If alternating current turbines are compared with direct current generators with cross-compound condensing engines, the cost of the building and foundations would be considerably greater for the latter installation; the boilers, condensers and other accessories would remain practically the same. We should assume, however, that the comparison would be between alternating current turbo-generators, and direct current turbo-generators; in which case the cost of the building and all equipment, exclusive of the generating units, would be essentially the same. Where alternating current is decided on the installation of turbines is practically the only thing considered, as recent developments in the design of non-condensing units makes them eminently satisfactory where water cannot be secured for condensing purposes. In the case of direct current many engineers prefer engine type units to turbo-generator units.

We give below the approximate first costs of generating units in a power plant installation to provide power and light for a large locomotive and car repair shop, with fifty pits in erecting shop, and sufficient car repair facilities to take care of the division on which the shop is located. Undoubtedly, for a shop of this character and size, most engineers would decide upon three prime generating units of approximately 750 kw. capacity each; and, if a combination system is considered, two motor generator sets of approximately 300 kw. capacity each, to provide direct current for the variable speed machine tools and, possibly, for the cranes. The first cost for generating units will be as follows:

Alternating current (turbines)	$41,500
Alternating current (engine type generating units)	74,500
Direct current (turbines)	65,000
Direct current (engine type generating units)	72,000
Alternating and direct current (turbines)	51,500
Alternating and direct current (engine type generating units)	84,500

Special attention is called to the fact that the above estimate on a combined system, contemplates the use of a synchronous motor in connection with the motor generator set as a power factor corrective device. It is the usual method for electrical manufacturers to rate alternating current generating units on the basis of 80 per cent. power factor. By actual practice, however, it has been ascertained that the power factor usually prevailing in both manufacturing establishments and railway shops, will vary from 55 per cent. to 75 per cent., rarely being as high as 80 per cent. On this account it is generally advisable to install a synchronous motor in the power plant, which can either be efficiently used for driving direct current generators or as a synchronous condenser, floating on the line to bring the power factor up to the desired point.

It is clearly evident that a straight alternating current installation is far cheaper in first cost, from the power plant standpoint, than either of the alternatives. Next, the distributing system must be considered. We are practically limited on account of commutation to 250 volts as a potential for transmitting direct current, but in the case of alternating current 440 volts or 550 volts are generally used. Taking into consideration transmission line losses alone, we can transmit nearly four times the power at 440 volts alternating current as at 250 volts direct current, with the same percentage of loss. In shop practice, however, the limited distance at which power is transmitted generally makes the current carrying capacity of the wire a determining feature, rather than the losses through resistance. On this account it will probably be found that the transmission lines for alternating current will require about 60 per cent as much of copper as those used for direct current. The percentage of loss, however, will, of course, be considerably less, on account of the higher voltage at which the current is transmitted.

It has been customary where direct current is used to operate both arc and incandescent lamps from a 250-volt circuit. With an installation of this character, the life and efficiency of incandescent lamps are greatly reduced, and the arc lamps do not operate as successfully as on a 125-volt circuit. The development of the tungsten lamp for shop lighting has practically made imperative the use of 125-volt transmission, which in the case of direct current would require special generators for this service, on the assumption that 250 volts has been standardized for power service. It is very simple in the case of alternating current to obtain the low tension lighting voltage, as the transmission can be made at the full voltage of the generating unit, and transformed to the desired potential near the point at which it is used.

Some consideration must be given to the relative cost of alternating current and direct current motors for operating machinery and cranes. We would estimate that the cost of alternating current motors for individual and group drive would be less than direct current motors, but the cost of alternating current motors for cranes will be somewhat in excess of direct current motors, as the fundamental principles of alternating current motor construction make is necessary to use on cranes much larger alternating current motors than direct current motors. The ease of speed control, however, is approximately the same, and it is doubtful if an operator could tell from the operation of the crane whether direct current or alternating current motors were applied.

As a general proposition, it is only fair to assume that the difference in first cost of electrical equipment for a large railway repair shop, based on the use of alternating or direct current, would be mainly represented by the difference in cost of

* Abstract of a committee report at the Chicago meeting of the Association of Railway Electrical Engineers, November, 1911.

the power plant equipment. The saving in the transmission system, by using alternating current, and the lower cost of alternating current motors for driving machine tools, would be practically counterbalanced by the increased cost of alternating current motor driven cranes and variable speed machines, where it is necessary to provide them with mechanical speed changes.

We should bear in mind the possible necessity in the future of transmitting current for a long distance for the purpose of operating pumps, or furnishing light to depots or other property removed from the power plant. Also the possible likelihood of purchasing alternating current from a hydroelectric company based on rates lower than the same current could be generated by the railway.

The general conclusion is that alternating current should be used exclusively in small division railway repair shops, where the capacity of generating units in the power plant does not exceed 500 kw., and that the combination of alternating current and direct current should be used in larger installations. The direct current units should be installed for the purpose of operating variable speed machine tools only. The use of alternating current for operating cranes, transfer tables, turntables and hoists is recommended as being wholly satisfactory, and no reason exists for converting alternating current to direct current for any of these purposes.

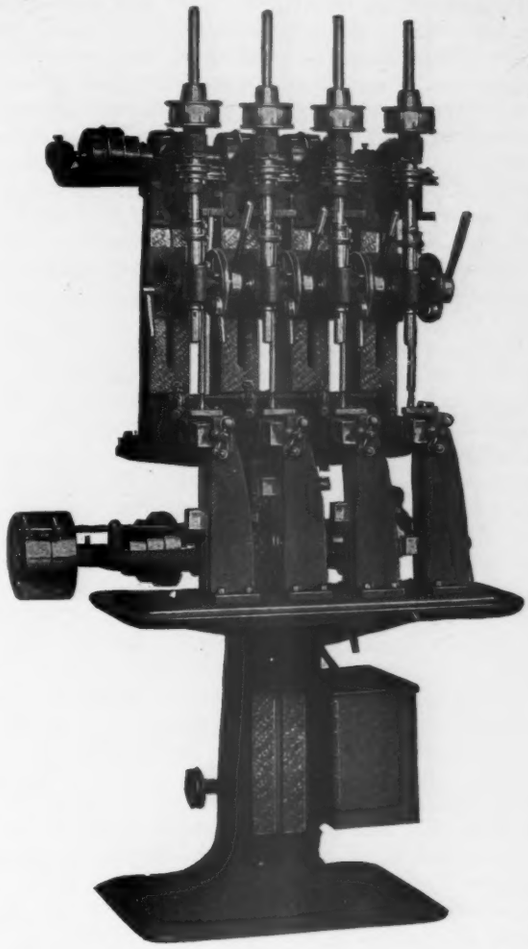
The modern railway shop requires compressor capacity of 1,000 to 10,000 cu. ft. of free air. In order to obtain this volume, it is necessary to use steam representing from 150 to 1,500 boiler h.p., which probably equals the amount of power necessary to operate all shop equipment driven by other methods. We desire to unequivocally endorse the substitution of electric power for compressed air wherever possible, and the development of electric drive for hoists, riveters, chipping hammers, drills, etc., makes it wholly practical to eliminate the majority of pneumatic appliances. It is also desirable to distribute a number of small compressors through the various buildings, these compressors to be electrically driven and arranged to automatically start and stop through pressure governors. While this method may not be wholly feasible under present operating conditions, it would not only be feasible but strongly advisable if the compressed air consumption is greatly reduced by the substitution of electrical equipment as above indicated.

FOUR SPINDLE STAYBOLT DRILL

In view of the recent recommendation of the Interstate Commerce Commission in regard to the use of telltale holes in boiler staybolts, the machine illustrated above is of particular interest at this time. Athough not a new tool in the strict sense of the word, as there are over a hundred in operation in various railroad shops, this staybolt drill herein illustrated, a product of the Foote-Burt Company, Cleveland, O., has been re-designed to take care of increased strain which is inseparable from the use of high speed steel.

The machine has a capacity of four 5/16 in. drills, and will take in staybolts from ¾ in. to 1¼ in. in diameter, and from 3 in. to 15 in. long. Each spindle is provided with three independent speeds and has two changes of power feed. Power feed is equipped with automatic knock-off, which can be set for any depth within the capacity of the machine. Both feed and speed can be readily changed on any spindle without changing the other spindles. Specially designed chucks with simple, quick acting gripping mechanism center the staybolts beneath each spindle and hold them rigidly in position. A hardened bushing is provided for the drill to run in, insuring its starting central with the piece held in the chuck. An oil pump is provided with suitable return tank so that liberal quantities of lubricant can be used.

On account of the extremely simple design of this machine and its ease of operation, a boy can readily keep all four spindles running to their maximum capacity, reducing piece costs to the minimum. The staybolt chucks are readily removable, leaving the machine available for a variety of sensitive drilling when necessary. The many praiseworthy features of this new



machine and its capacity would indicate that it is an indispensable adjunct to a boiler shop, especially one engaged on locomotive work.

THE RESULTS OF PENNSYLVANIA RAILROAD FORESTRY.—A fine example of what may be done in the way of reforestation is shown by the Pennsylvania Railroad. This road started some years ago to plant trees on its own property in all appropriate places, setting large numbers of them in previously unused places alongside the tracks. It has begun to reap the harvest. In the last three years the Pennsylvania has used 2,600,000 board feet of lumber and 15,000 trees grown by this system on its own land. The company is constantly increasing its wooded area, and hopes ultimately to supply all its own needs in the way of track ties and timber for other purposes.

A CONFERENCE ON CAR WHEELS was held in New York on November 10, at the Waldorf-Astoria Hotel, and the following were among those representing the Master Car Builders' Association: W. Garstang, superintendent of motor power, Big Four Railroad, Indianapolis, Ind.; C. A. Brandt, mechanical engineer, Big Four Railroad, Indianapolis; R. L. Ettenger, consulting mechanical engineer, Southern Railroad, Washington, D. C.; J. M. Henry, master mechanic, Pennsylvania Railroad.

IT IS STATED THAT THE FOLLOWING PREPARATION will keep machinery clean for months under ordinary circumstances, as, for instance, in a show room: One ounce of camphor, dissolve it in 1 lb. of melted lard, and add enough plumbago powder to make the mixture the color of iron. Clean the machinery, and smear it with the mixture. After 24 hours rub to a finish.

PROPOSED SPECIFICATIONS FOR POSTAL CARS

Specifications covering the construction of all steel and steel underframe postal cars are desired by the post office department, and it has called upon the railways for their co-operation and assistance. After several conferences, the sub-committee of mechanical officers of the Special Committee on Relations of Railway Operation to Legislation, the committee of the post office department and the chief engineers of the leading car building companies have submitted to the railways a proposed specification which will be brought up for discussion at a meeting on December 4 at Washington, D. C.

The proposed specification is as follows:

GENERAL.

Type.—Postal cars may be built according to any of the following types of construction: (a) Heavy center sill construction, the center sills acting as the main carrying member. (b) Side carrying construction, the sides of the car acting as the main carrying members having their support at the bolsters. (c) Underframe construction in which the load is carried by all the longitudinal members of the lower frame. The super-structure framing may be of steel or of wood re-enforced as per R. M. S. Specification Plan No. 1. (d) Combination construction in which the side frames carry a part of the load, transferring same to the center sills at points remote from the center plate for the purpose of utilizing uniform center sill area. Steel castings may be used as parts of the underframe in any of the above types.

Materials.—All rolled steel plates and shapes used in the car framing shall be made by the open-hearth process. The physical and chemical properties of all material used in the car framing shall be in accordance with the latest standard specifications of the American Society for Testing materials, as follows: The standard specification for structural steel for bridges, for steel plates, shapes and bars; the standard specification for wrought iron, for iron bars and plates; the standard specifications for steel, malleable iron and gray iron castings.

Workmanship.—All workmanship throughout the car shall be first-class. The jointing of the car framing shall be made so that the structure as a whole shall be built to dimensions specified, and all joints exposed to the weather shall be made tight against leakage.

Live Loads.—The car body shall be designed to carry the specified live load in addition to its own dead weight under service conditions. Where no live load is specified the maximum capacity of the car, as determined by wheel loads, shall be used as a basis for calculations.

Buffing.—The maximum end shock due to buffing shall be assumed as a static load of 400,000 lbs applied horizontally at the resultant line of the forces acting at the center line of the buffing mechanism, and at the center line of draft gear respectively, and shall be assumed to be resisted by all continuous longitudinal underframe members below the floor level, provided such members are sufficiently tied together to act in unison

Details.—All connections, except those specified in the second paragraph under end construction shall be designed for the maximum strain to which the member connected shall be subject, and secondary stresses in any members caused by eccentric loads shall be properly combined with the direct stresses in such members. The maximum fiber stress in any member subject to both direct and secondary stresses may be taken at 20 per cent. greater than those given in the paragraph on stresses, but the direct stresses considered alone must not exceed the allowable stresses given in said paragraph.

The minimum distance between centers of rivet holes shall be three diameters of the rivet, and the minimum distance between the center of the rivet hole and a sheared edge shall be not less than one and one-half times the diameter of the rivet. Below the floor line, framing connections of floor beams, posts, etc., may be of rolled steel, pressed plate, or cast steel, and above the floor line such connections may also be of malleable iron. Connections for I-beams, channels or tees may also be made by coping the flanges and bending the web to form a knee, and for angles by coping one leg and bending the other. The use of fillers in the underframe and superstructure shall be avoided wherever possible. All holes for rivets or bolts in the underframe, superstructure and outside finish shall be drilled or punched and reamed to size and fairness. No drifting of holes will be allowed. In deducting rivet or bolt holes to obtain the net area of any section, they shall be taken at 1/16 in. larger than the diameter of the rivet or bolt. The effective area of a rivet shall be taken as its area before driving. All rivets when driven must completely fill the holes and have full concentric heads or be countersunk when required.

Center Sills.—The center sills may be built up or composed of rolled or pressed shapes, either with or without cover plates, and cast steel draft sills or end construction may be used in connection with any of the above types, with suitable riveted connections at splices. Built-up center sills may be either of uniform depth or of the fish-belly shape, and may be composed of rolled shapes, web plates, flange angles and cover plates. If preferred, the web plates may be flanged and angles omitted. When flange angles are used they shall be connected to the webs with a sufficient number of rivets to transfer the total shear at any point in a distance equal to the depth of the sill at that point. When cover plates are used they must extend at least two rows of rivets at each end beyond their theoretical length.

Bolsters and Cross Bearers.—The body bolsters and cross bearers may be of either cast steel or built-up construction, with ample connections at the center and side sills to transmit the calculated vertical shear.

Floor Beams.—Transverse floor beams may be of rolled or pressed shapes, with suitable connections at center and side sills.

Floor Supports.—Longitudinal floor supports shall be supported at each transverse floor member.

End Sills.—The end sills may be either of rolled or pressed shapes, built-up construction or cast steel, with ample connections at center and side sills. They must be designed for the maximum vertical loads to which they may be subject and also for the assumed horizontal loads transferred from the vertical end members as specified in the third paragraph under "end construction."

SIDE FRAME.

General.—In calculating the stresses in the side frame its effective depth when designed as a truss or girder may be taken either as the distance between centers of gravity of the side plate and side sill or as the distance between centers of gravity of belt rail and side sill. At the side door openings the bending moment caused by the vertical shear at the door post shall be considered as being resisted by the section above and below the door openings, and the sum of the direct stresses and those due to bending at such section shall not exceed the stresses specified. A sufficient proportion of any reinforcing members added to these sections shall be extended far enough beyond the door posts at each side so that their reaction can be taken care of by the side frame without exceeding the limit specified for stresses.

Posts.—The sum of the section moduli taken at any horizontal section between the floor and the top line of windows, of all posts and braces on each side of car, located between end posts, shall be not less than .30 multiplied by the distance in feet between the centers of end panels, a panel length being considered as the distance between lines of rivets in adjacent vertical posts.

Sheathing.—Outside sheathing plates shall be not less than ⅛ in. in thickness.

ROOF.

General.—The roof may be of either the clear-story or turtle-back type, depending on the standard contour of the railway for whose service the cars are built. In the clear-story type the deck plates shall be in the form of a continuous plate girder, extending from upper-deck eaves to deck sill, and either built up of pressed or rolled shapes or pressed in one piece from steel plates. The carlines may be of either rolled or pressed steel shapes, extending in one length across the car from side plate

to side plate, or may extend only across the upper deck. In the latter case the lower deck carlines may be formed by cantilever extensions of the side posts or by independent members of pressed or rolled shapes. In the turtle-back type, the carlines may be of either pressed or rolled shapes, extending in one length across the car between side plate and side plate, or may consist of cantilever extensions of the posts.

Carlines.—The projected area of the portion of roof in square feet supported by carlines, divided by the sum of the section moduli of the carlines must not be more than 100.

Roof Sheets.—Roof sheets, if of steel or iron, shall be of a minimum thickness of 0.05 in., and either riveted or welded at their edges.

END CONSTRUCTION.

Vertical End Members.—The sum of the section moduli of all vertical end members shall be not less than 35, and the section moduli of the main members, either forming or adjacent to the door posts, shall be not less than 75 per cent. of this amount.

The horizontal reactions of all vertical end members at top and bottom shall be calculated from an assumed external horizontal force applied 18 in. above the floor line, to all vertical members in the proportions given above, such force being of sufficient amount to cause bending of all vertical members acting together, and top and bottom connections of vertical members shall be designed for these reactions.

Except where vertical end members shall bear directly against or be attached directly to longitudinal members at either top or bottom, the assumed reactions shall be considered as loads applied to whatever construction is used at end sill or end plate, and both these last named members shall have section moduli, respectively, sufficient to prevent their failure horizontally before that of the vertical end members.

End Plate.—The end plate may be a rolled or pressed section, or of built-up construction, and shall extend across the end of the car from side plate to side plate, with ample connections at the ends, or shall be of other satisfactory construction to withstand the assumed loads given above.

Stresses.—All parts of the car framing shall be so proportioned that the sum of the maximum unit stresses to which any member is subject shall not exceed the following amounts in pounds per square inch, except as modified in the first paragraph under "details," the second and third paragraphs under "end construction." These stresses, unless otherwise stated below, are for steel having an ultimate tensile strength of from 55,000 to 65,000 lbs. per square inch. Where other materials are used, they shall bear the same proportion to the ultimate strength of the material used.

The stress in built-up bolsters shall not exceed 12,500 lbs. per square inch.

The stress in cast steel for bolsters and other details shall not exceed 8,000 lbs. per square inch.

The stress in sills and framing shall not exceed 16,000 lbs. per square inch.

For members in compression the above stresses shall be reduced in accordance with usual engineering practice.

RIVETS (RIVET STEEL).

Shear, other than buffing	10,000	lbs. per	sq. in.
Bearing, other than buffing	20,000	"	"
Shear, buffing	12,000	"	"
Bearing, buffing	24,000	"	"

Floor.—Sub-floor of postal cars to be of iron or steel plate, upper or wearing floor of composition or of matched wooden flooring, maple or yellow pine preferred, with proper insulation. Composition flooring may be secured by corrugated, keystone or equivalent style of plate or by wire fastening which is anchored to the sub-floor.

Interior Finish.—Inside, side and end linings and head lining of postal cars to be of flat or corrugated steel plate, composition board or wood, preference in the order named, properly secured to the car framing.

Insulation.—Suitable fabric or material shall be used as an insulation against cold or heat in the side and end walls and roof of steel postal cars, securely fastened as the nature of the material may require for efficiency and durability.

Doors and Windows.—Postal cars to be equipped with such side doors, end doors and side windows as are shown on the standard plans of the R. M. S. department. Doors and windows may be made of wool or metal and when glazed the glass shall be double strength. Trimmings and locks to be the railway company's standards. Doors and windows, including swinging deck sash, to have suitable weather stripping.

Lighting.—Lighting of postal cars primarily to be with electricity or gas with candles provided for auxiliary light. Distribution of light shall be in accordance with the requirements of the working space and doorways. Electric light installations on postal cards shal include distribution, preferably by condulet system with separate circuits, cut-outs, and switchboard regulation; lamps to have shades of railway company's standard. The generator, distribution, battery boxes and their equipment, train connectors, charging plugs, other accessories, and all wiring to be as per the railway company's standard practice. Gas lighting installations on postal cars to be in accordance with the railway company's standard practice.

Heating.—Heating of postal cars primarily to be with steam, applied either as a vapor system, with separate regulation for each coil, hot water steam heated, or direct pressure steam, with preference in the order named. Pipes are to have suitable protection guards of wire or perforated steel. For postal cars running into territory requiring them, an auxiliary coal burning stove shall be furnished, complete with coal box and firing tools, smoke jack and protection guards. The stove and coal box to be securely fastened. The stove may be used to heat direct or to heat the coils of an auxiliary hot water system. The train pipe steam line to be applied and equipped with end valves, steam hose and couplings, as per M. C. B. requirements and the railway company's standards.

Ventilation.—Ventilation of postal cars of clear-story design to be accomplished by means of swinging deck sash protected by screens. Trimmings of swinging deck sash to be railway company's standards. Postal cars not having clear-story roofs are to have a sufficient equipment of self-acting ventilators in the roof.

Vestibules.—Postal cars are to be equipped with railway company's standard short vestibule.

Couplers and Draft Gears.—The details of the coupler and draft gear to be in accordance with M. C. B. and U. S. safety appliance requirements, and the practice of the railway for which the cars are built.

Buffing Mechanism.—The details of the buffing mechanism to be in accordance with the practice of the railway for which the cars are built.

Brake and Signal Equipment.—Postal cars to be equipped with automatic air brakes and signal equipment of the latest design railway company's standard. Hand brakes in accordance with U. S. safety appliance standards. Brakes to be applied to all wheels, and to be preferably arranged inside on four-wheeled trucks. The braking power should not be less than 80 per cent. of the light weight of the car, based on 60 lbs. air pressure in the air brake cylinder. Suitable cord or attachments shall be furnished for convenient operation of the conductor's valve and train signal system.

Steps, Handholds, Signal Brackets.—The details of the steps, handholds and signal brackets to be in accordance with U. S. safety appliances and M. C. B. requirements and the practice of the railway for which the cars are built.

Stanchions and Screens.—Permanent stanchions in storage ends and at ends of pouch racks, screen frames, and screens to be located as per standard R. M. S. plans.

Safety Bars.—Safety bars to be applied in an equivalent manner to that called for in R. M. S. specifications, plan No. 1.

Interior Equipment.—The following list of equipment shall be arranged as shown on standard R. M. S. drawings, the details as per railway company's standards: letter cases, pouch racks, paper boxes, distributing table, hinged table, shelf and letter drop, general order case and tag case, drawers, pouch catcher, cinder guards and brackets, hopper, wash stand, water cooler, water tank, mirror, wardrobe, fire buckets, fire extinguishers, and wrecking tools.

TRUCK.

General.—Trucks may have either the built-up metal or cast steel frames, and may be either of the four-wheel or six-wheel type, within the limit of wheel loads given below. For cars equipped with one cast iron brake shoe per wheel the effective maximum emergency brake shoe pressure must not exceed 18,000 lbs. per shoe. When two brake shoes per wheel, or one shoe per wheel having a higher coefficient of friction than cast iron are used, the wheel loads may be increased to the allowable carrying capacity of the M. C. B. standard rules.

Wheel Loads.—Maximum weight of loaded cars must not exceed 15,000 lbs. per wheel for M. C. B. standard axle having 5 in. x 9 in. journals, or 18,000 lbs. per wheel for M. C. B. standard axle having 5½ in. x 10 in. journals.

Details.—Wheels shall be either all-steel or steel-tired. All other truck details, including body and truck center plates and side bearings, shall be in accordance with M. C. B. requirements and the practice of the railway for whose service the cars are built.

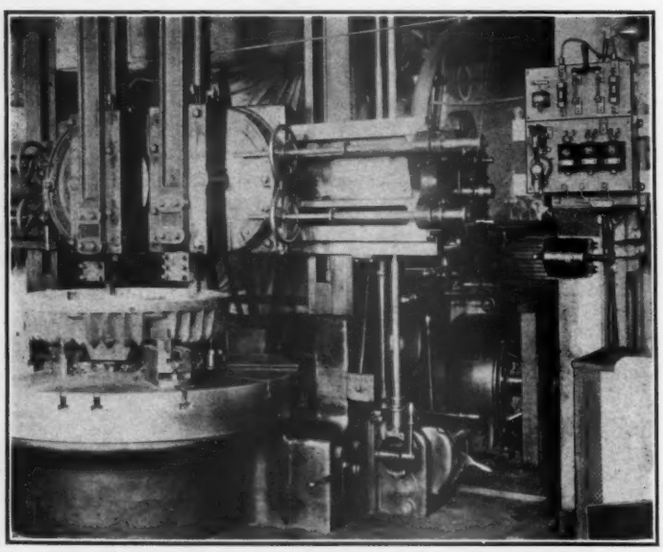
Painting.—The painting of car body and trucks shall be in accordance with the railway company's specifications for steel cars.

Lettering and Numbers.—The lettering and numbers of postal cars to conform to R. M. S. requirements and the railway company's standards.

AUTOMATIC CONTROLLERS FOR MOTOR DRIVEN MACHINERY

The Electric Controller & Manufacturing Company, of Cleveland, O., has recently placed on the market a line of automatic controllers designed for the specific purpose of giving the utmost convenience in the control of motor driven machinery. It has been estimated that the output of many machines can be increased 20 per cent. by the central grouping and convenient arrangement of all the operating levers. Handiness of control is recognized as being very important in securing the utmost production from a machine, and the automatic controllers described in this article were designed to provide this handiness of control for starting, stopping, or reversing the motor and machine.

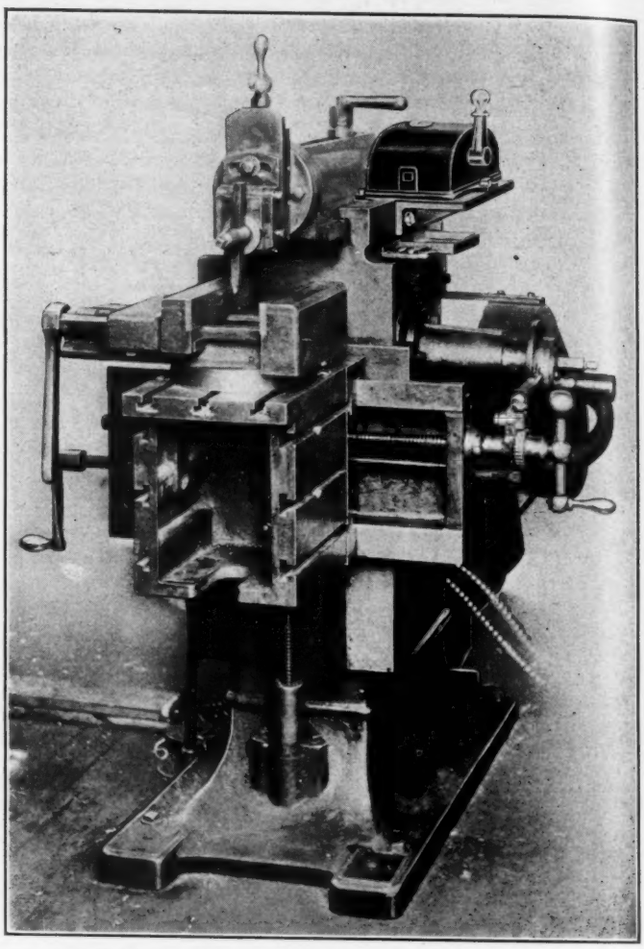
The controller consists of a small operator switch and an accelerating unit. The controllers are built in three types to



AUTOMATIC CONTROLLER ON BORING MILL.

secure: (1st) non-reversing and dynamic braking; (2nd) reversing without dynamic braking; (3rd) reversing and dynamic braking. In each type a variety of four different forms of accelerating units are offered. These accelerating units vary in their design from a simple train of accelerating switches up to a unit having a fused service switch, a train of accelerating switches, and complete circuit-breaker features.

The accelerating unit automatically accelerates or decelerates



MOTOR DRIVEN SHAPER EQUIPPED WITH AUTOMATIC CONTROLLER.

the motor through the action of series wound accelerating switches which possess the remarkable characteristic of acting, not only as switches, but as current limit relays as well. When the current in the winding of one of these switches exceeds a predetermined value the switch locks open and cannot close until the current is reduced to the proper value.

When the operator's switch is thrown to the running position, current flows through the motor, all of the starting resistance, and the coil of the first series wound accelerating switch. As the motor accelerates the current drops, and when it reaches the correct value the first accelerating switch closes, cutting out a portion of the starting resistance. The succeeding accelerating switches operate similarly, ultimately cutting out all of the starting resistance and putting the motor across the line. By throwing the operator's switch to its original position, the motor is disconnected from the line and consequently stops. Different positions of the handle of the different types of operator's switch provide for drifting, reversing, or rapid stopping by dynamic braking. Dynamic braking is secured by a change of connections, accomplished by the operator's switch, which first inserts all the starting resistance in series with the armature. The motor is then quickly and evenly brought to rest by automatic dynamic braking, the accelerating switches, in this case, acting as decelerating switches by cutting out, step by step, the resistance as the current, generated by the motor, decreases due to the slowing down of the motor.

The manufacturers claim the following important advantages for this automatic controller: 1st—It limits the acceleration and deceleration current at all times to a safe value. 2nd—It accelerates and decelerates the motor in the minimum, safe amount of time, and automatically varies the time of acceleration and deceleration, depending upon the load which the motor has to

start and stop. 3rd—It provides the best conditions for good commutation. 4th—By limiting the current, both in starting and stopping, it limits all mechanical strains on the motor and driven machinery. 5th—It obviates the necessity of mechanical clutches on many motor-driven machine tools. 6th—It adds very materially to the safety of an installation, since in case of accident the motor may be quickly stopped. 7th—It inherently provides no-voltage protection, for if the voltage fails the switches drop open, and upon the return of voltage they automatically close in their regular method and sequence, again accelerating the motor to full speed.

AN UNIQUE STEEL STORAGE BIN

One of the later products of the Berger Manufacturing Co., of Canton, O., is a very interesting steel storage bin which embodies the decided novelty of having shelving adjustable to the size of the articles to be stored. This is done by rearranging the partitions, which are easily inserted and bolted in place. Wherever small appliances and parts are carried in bulk, such as valves, nuts, bolts, screws, pipe elbows, unions, etc., this is a

great improvement over the design of the uniform wooden bins such as are ordinarily encountered in railroad storehouses, and which unquestionably waste a vast amount of space, as all bins are of the same size, irrespective of the variation in demand for the objects which they contain.

The bins herein illustrated are made in the form of a gigantic cabinet. Flat pieces of steel form the back and dividing partitions, upright and horizontal, and stove bolts through the angles make the entire bin secure and permit of adjustment. The shelves are held at the front by shelf supports, when it is desired to use the shelf as a bin to prevent small material from falling out, but when to be used simply as a shelf it is supported by a hanger.

The general design may be likened to the ordinary egg crate. It is made up of a continuous center partition or back, the full length of the bin. This center partition, which is a back for a

single face bin, serves as a center of dividing back partition for a double face bin. The uprights at right angles to the center partition or back carry a part of the shelf load, the shelves being attached to them at the front and back by stove bolts. Besides the back and uprights, the bottom and top shelves tie the construction firmly together. The bin section can be erected with ordinary labor, the only tool necessary being something to tighten the stove bolts.

These bins have been put through some severe and conclusive tests, which are clearly shown in the accompanying illustrations, with the idea, of course, to prove their strength and utility. One stringent test was the placing of heavy loads in the various compartments of a section; slabs of spelter, averaging 63 lbs. each, being used. The bins were loaded from 819 to 1,827 lbs., and with a total weight of spelter in the section of 15,220 lbs.—more than 7½ tons—there was no apparent deflection at any point.

The indestructible and fireproof qualities of the new bins has attracted considerable attention from purchasing agents and storekeepers, and they are being rapidly installed in practically every field of manufacture where varied stock must be carried.

A CAR SHOP NECESSITY.—There is probably no machine more essential in the car-building shop than the mortising machine. For many years this work was done by machines of the pounding type but since the development of the hollow-chisel type of machine this latter form has been specified almost exclusively by the modern railway shop. The hollow-chisel machine has the great advantage of the elimination of all pounding and jarring, thus insuring greater accuracy, clean mortises and saving of time formerly required for the removal of chips.

THE EDUCATIONAL BUREAU of the Illinois Central, since the announcement of its establishment on July 1st, has received 5,000 applications for membership from employees of the road. More than 2,300 employees are regular students of one or more of the different courses offered.

VARIABLE LEAD ATTACHMENT FOR RADIAL VALVE GEARS

The invention herein described and illustrated relates to locomotive valve gearing of the so-called radial type, and has particular reference to an improvement over the Walschaert, in providing an attachment whereby the lead may be increased or decreased, as desired, instead of maintaining a constant lead as in the designs now employed.

As set forth by the inventor, R. M. Wiggins, of Trenton, Mo., a further object is to provide a valve gear with a "lead controller" operated from the locomotive cab which does not necessitate the provision of additional valves and consequent extra valve gear, but which forms a simple attachment to the mechanism now commonly employed. It is also sought to obtain a better distribution and hence less consumption of steam with the resultant fuel and water economies. Mr. Wiggins claims that this lead controller is adapted to increase the lead, to accelerate and to maintain a comparatively high rate of speed, and to decrease the lead to effect a correspondingly slow movement and more powerful stroke.

The action of the device may be readily understood from the two drawings, Fig. 1 being a side elevation, showing the improved gear adjusted to increase the lead, and Fig. 2 a similar view disclosing the valves "line and line," or completely closing the admission port. Explanatory of the attachment it may be said that the valve rod (26) is secured at its outer extremity to a sliding block (27) mounted upon a guide rod (28). This latter is preferably of circular form and adapted for passage through a corresponding opening formed in the lower end of block (27). A floating lever (29) is hinged upon the sliding block (27) by a pin in its upper end, and above this point it is formed with an accurate longitudinal slotted portion (31) to form a fixed link. A connecting block (32) is mounted to slide upon the guide rod (28) and carries the inner end of a radius blade (33) extending toward the fixed link. A sliding block is mounted in the link slot and is attached to the outer end of the radius blade. An auxiliary lifting shaft is journaled above the connecting block (32) and this bell crank form is connected on the upper arm by a rod to the hand lever in the cab, and on the lower arm by means of the hanger (36) to about the center of the radius blade (33).

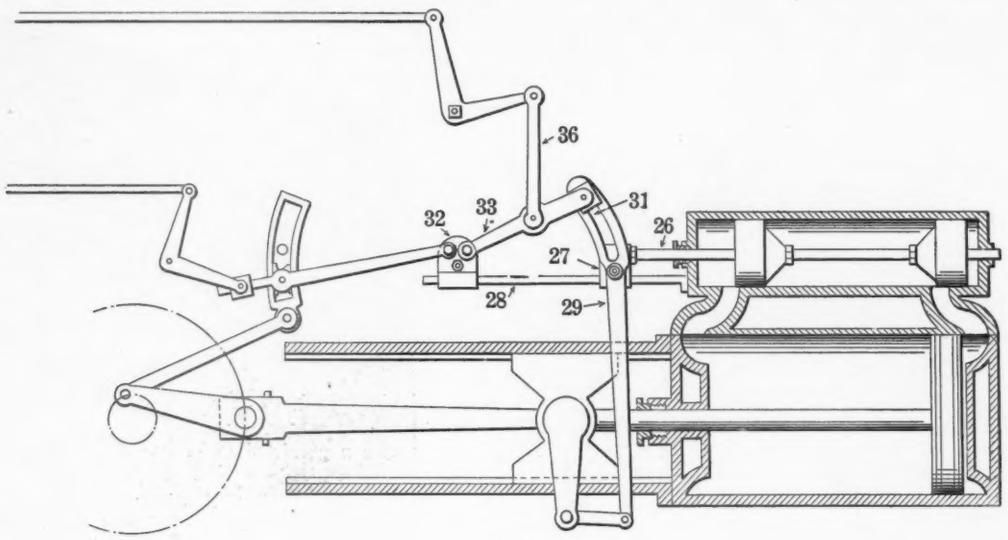


FIG. 1.

Referring to Fig. 1, it will be noted that the hanger (36) is raised to draw the sliding block to the top of the link slot. In this position the piston valve is moved so as to partially close the admission port and advance the lead of the valves. In Fig. 2 the hanger is moved down to hold the block in the lower end of the link so as to position the valve line and line, completely closing the admission port. In this instance the lead is retarded and the exhaust port is disclosed as being slightly open. The

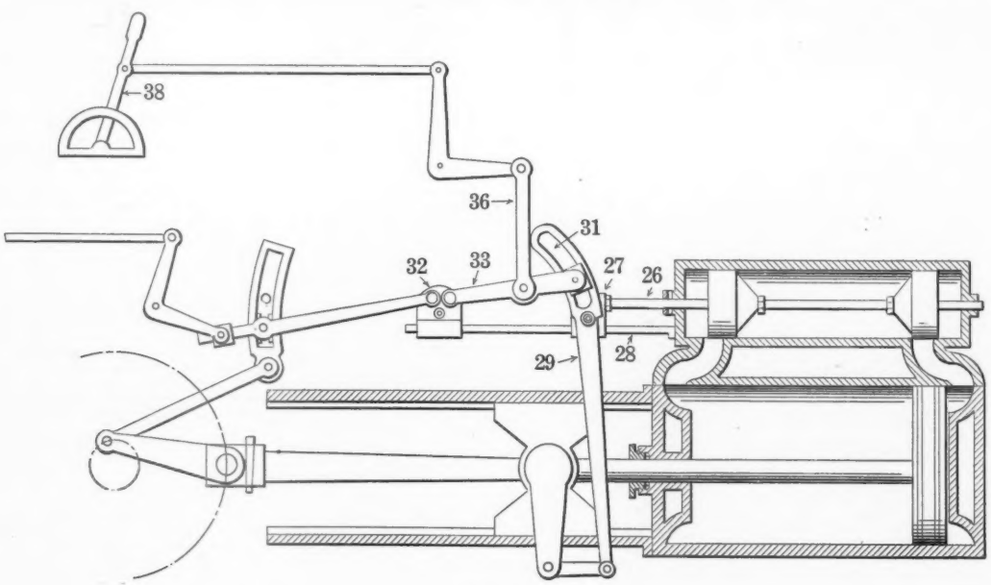
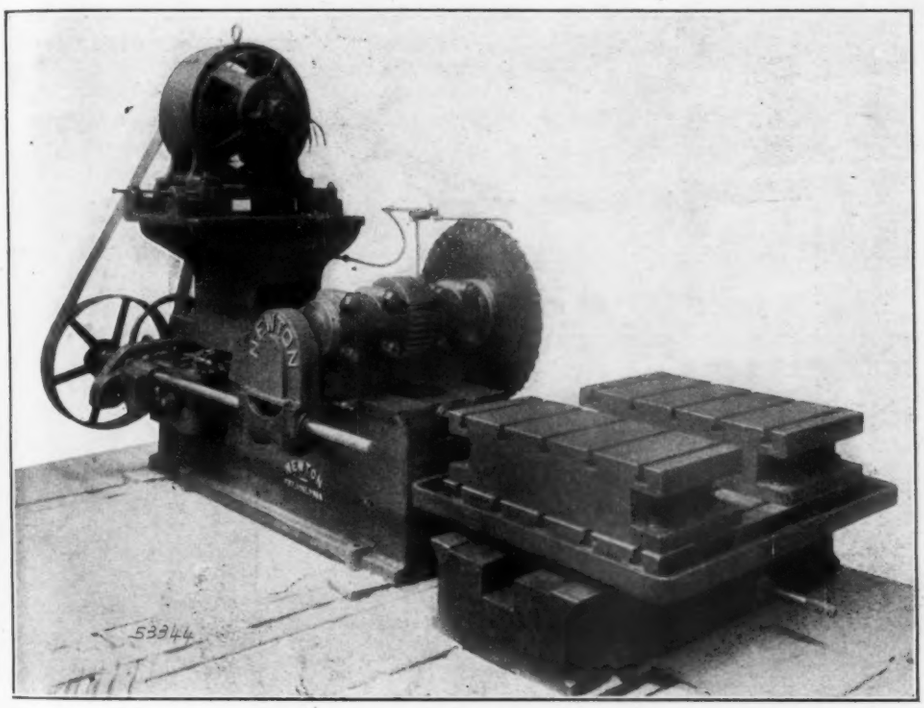


FIG. 2.

hanger (36) may be adjusted into various vertical positions by means of the hand lever to move the valves within the steam chest to increase or decrease the lead.

HIGH PRODUCTION COLD METAL SAW

In continuation of the effort to secure the very highest possible development in metal sawing machines, the Newton Machine Tool Works, of Philadelphia, Pa., has recently placed on the market a new design which embodies all the best features known for the successful operation of such machines at the present time. The machine illustrated is particularly intended for use in steel foundries and in accordance with the manu-



VERY POWERFUL FOUNDRY SAW.

facturers' specifications for such is fitted with special provision to increase the life, as the sand and grit in steel foundries is very injurious to the flat and circular bearing surfaces. For this reason all shears are very broad: the bearings are bushed where necessary and the spline shafts are fitted with collars to rotate with the shaft in the bearings, to prevent the escape of oil.

The machine is of the spindle driven type, the spindle revolving in bushed capped bearings, and is supported at each end. The driving spindle gear is mounted between them. The drive to the spindle is by means of broad face 60 carbon hammered steel gears and the teeth of the driving pinion meshing with the spindle gear are cut from the solid worm wheel shaft. The driving worm wheel is one solid bronze casting and the driving worm is of hardened steel with teeth of steel lead, and both the worm and worm wheel are encased for continual lubrication. The bearing for the worm wheel is cast solid with the saddle, and to prevent the escape of oil through keyways and also to prolong the life of the bearing special extra bushings are mounted on the spline shafts in both ends of this bearing. The saddle is of very heavy construction, has square bearings on the base with interlocking gibs cast solid and the adjustments are made by means of taper shoes. The saddle has a bearing its full length on the shears, and the feed screw has a bearing on both ends to permit of its always being maintained in tension.

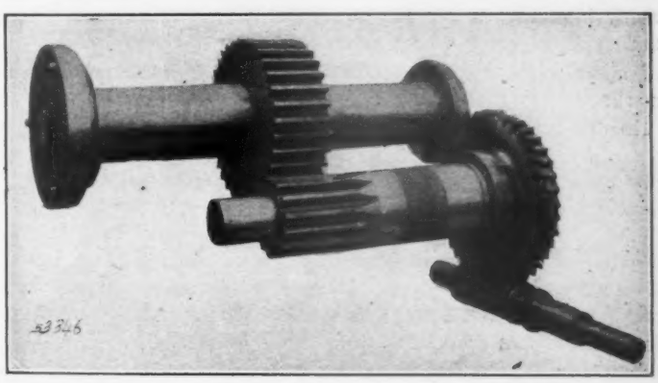
Gear feed is provided, having six changes, with quick return, and by the use of a double throw switch or reversing motor this fast power traverse is available in both directions. The saddle is fitted with adjustable, automatic and positive safety release to the feed and fast traverse.

The work table is 36 in. wide by 48 in. long, entirely surrounded by an oil pan, is fitted with five "T" slots and there is 20 in. of hand cross adjustment. The auxiliary parallels are each 16 in. wide, 36 in. long, 9 in. high and fitted with five "T" slots. These are provided to permit of clamping the work closely on each side of the saw blade and still maintain clearance for the latter. This feature is particularly desirable for making two cuts on one piece in the same setting.

The diameter of the saw blade, which is the Premier inserted tooth type, is 32 in. The capacity for gates or risers is for 9½ in. diameters in one cut, and the length of travel of feed to the saddle is 14 in. The smaller illustration very clearly shows the drive; the teeth of the spindle cut from the worm wheel shaft; the method of supporting the pinion on both sides of the teeth; the solid bronze worm wheel having teeth of steel lead; the hardened steel worm and the roller thrust bearings. The ground spindle is fitted on the saw end with three circular keys for driving the blade, and three bolt holes for holding the blade in place. On the opposite end are adjusting nuts to take up the wear. The simplicity of this drive as a whole with its evident great strength and rigidity forms probably the most interesting feature in the consideration of the general design.

This particular machine is driven by a 10-horsepower Fairbanks, Morse Co. type B motor No. 5, running at 1,200 r. p. m. To insure the highest efficiency from the motor connection an extra long belt center is provided, and the top of the bracket is arranged to permit of slight adjustment of the motor to tighten the belt.

To the features of this general design, in addition to the heavy construction, the builders attribute their success in making a number of sawing cuts through a 5½ in. diameter 35 carbon bar in 1 min. and 35 seconds. This, of course, could not be maintained in actual practice, except with the knowledge that the machine would be worn so badly that its efficiency would be very low in a very short time.

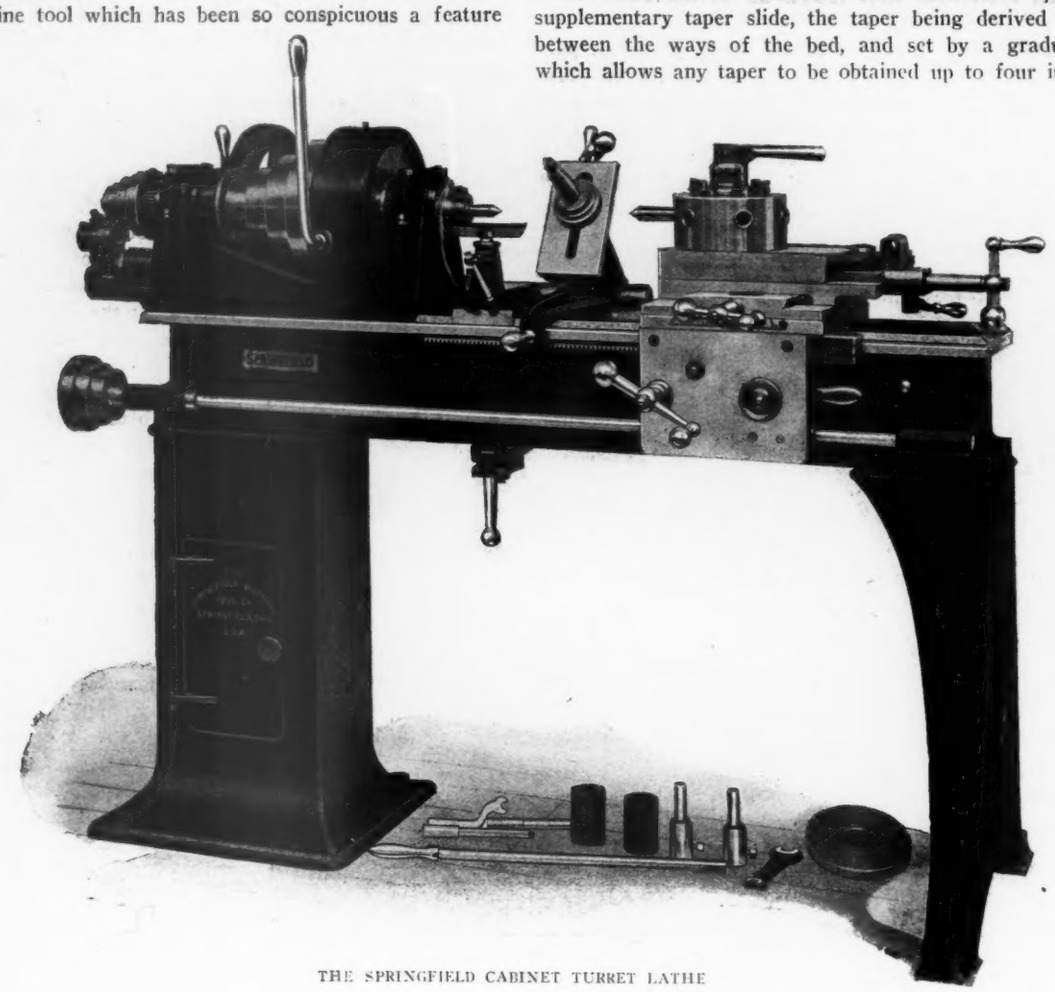


DETAILS OF DRIVE.

IT IS ESTIMATED THAT THE RAILROADS of Argentine will import 300,000 tons of rails during 1911. That country has about 19,000 miles of track and many new branches are being constructed each year.

NEW CABINET TURRET LATHE WITH FRICTION-GEARED HEAD

The finely designed turret lathe which forms the subject of the accompanying illustration is the latest production of the Springfield Machine Tool Co., of Springfield, O., and may be said to represent another advance in the development of this popular machine tool which has been so conspicuous a feature during the last few years in the mechanical world. In the rush of production and competition many important improvements have possibly been overlooked by those either directly or indirectly interested in the general subject of machine tool design, and it is therefore timely to allude to the distinctive features of merit which may be embodied in any new creation on the market.



THE SPRINGFIELD CABINET TURRET LATHE

In this instance the builders have worked successfully toward the end desired—to include in this machine new details and improvements which must result in further efficiency, not only in economy of operation, but in increased range of work. Particularly in this connection it will be noticed that the clutch mechanism of the turret head makes it capable of being handled much quicker than the old style—a feature which will be particularly interesting to brass workers who are always on the lookout for machinery to cheapen their product.

Some special features in connection with the turret are of interest. It is provided with automatic engine feed, with three changes, which may be reversed by the handle at the left-hand side of the apron, and directly at the hand of the operator. There is also a longitudinal movement by either lever or screw. The top slide of the turret rests upon a slide having a right angle hand movement operated by a screw to the front of the machine, which allows a large range for facing off work held in the chuck. When using this hand set-over, the holes in the turret can always be brought central with the spindle by a positive stop. The stop can be quickly removed when the tools are to be used on the back side of the spindle center.

The turret is further designed so that one slight backward movement of the blade loosens it, and at the same time withdraws the locking pin; while a slight forward movement produces the fractional revolution of the turret for the next tool, and at the same time locking and tightening it—the entire operation being effected in an instant by one hand.

The slide has an additional cross movement operated by a supplementary taper slide, the taper being derived from a bar between the ways of the bed, and set by a graduated index, which allows any taper to be obtained up to four inches to the foot. This obviates the necessity of setting over the headstock for taper boring or turning, and by this new taper attachment work can be faced off square when taper work is completed, without any change. When used for straight work the taper slide is locked to the saddle by a tapered toolsteel pin, having a square head for its ready removal.

The automatic feed allows pieces of any length to be operated on within the range of the machine. When this feed is not used the saddle may be locked to the bed by the gib screw at the right-hand side of the apron.

Another new feature of the machine permits left-hand threads to be cut with right-hand leaders thus saving the cost and annoyance of a separate set of left-hand hobs and leaders. The different pitches of threads are obtained by the well-known follower and leader device. One leader and follower to cut 11½ threads per inch, also one hob to cut the follower are furnished as part of this equipment. The machine rests upon one cabinet and one plain leg, to the former of which can be fitted shelving for the reception of tools, chucks, etc.

The general dimensions of the 15 in. by 5 ft. machine are as follows:

Diameter of turret	7½ in.
Length of carriage	12 "
Movement of top slide	5¼ "
Cross movement of top slide	6¼ "
Diameter of turret holes	⅞ "
Number of holes	6
Width of belt	2 in.
Back gear ratio	10 to 1
Hole in spindle	1 in.
Shipping weight	1,700 lbs.

NEW MACHINE TOOL FOR CUTTING SQUARE HOLES

Much has been written pertaining to the problem of boring square holes, and attempts towards the construction of a practical tool for this class of work have been numerous.* Various designs in the shape of attachments for ordinary lathes or milling machines, etc., have been recently offered in the market, but they have generally failed to produce satisfactory results, owing to the difficulties in the proper mounting of the device on any standard machine tool.

Experiments along this line have conclusively proved that such attachments cannot be fastened rigidly enough to withstand the amount of side thrust caused by the eccentric jarring motion of the cutter, at right angles to the working spindle. It was further demonstrated that the carriage of the average lathe did not offer sufficient stiffness to hold the working pieces rigidly in position, which latter is one of the vital points in obtaining perfect square holes.

The R. K. Le Blond Machine Tool Company, of Cincinnati, O., has taken an interest in the solution of this problem, and after careful study of the subject, and especially of its former weaknesses, has reached the conclusion that this work can only be satisfactorily performed with a special machine tool, in which arrangements for cutting square holes are embodied in the design, thus guaranteeing absolute rigidity and accuracy. Considering, however, that a machine which would do nothing else but cut square holes would be too great an investment for many customers a combination machine tool has been designed which is not only adapted for milling square holes, but also possesses all the features of a standard milling machine.

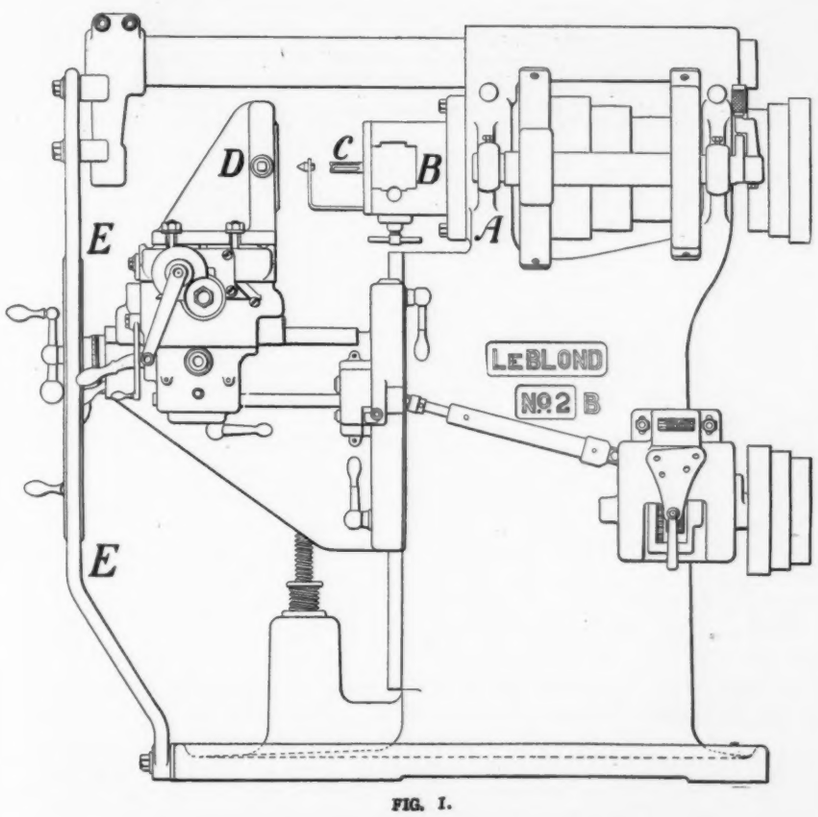


FIG. 1.

The principle used in this work is the same as employed in other devices, viz., the revolution of a triangular-shaped bit, similar to an end mill, in a stationary master guide, which in appearance is much like a regular drill chuck. Entirely different, however, from all previous devices this stationary guiding chuck is fastened directly to the column of the machine by means of a flange which entirely eliminates the former troubles arising from lost motion.

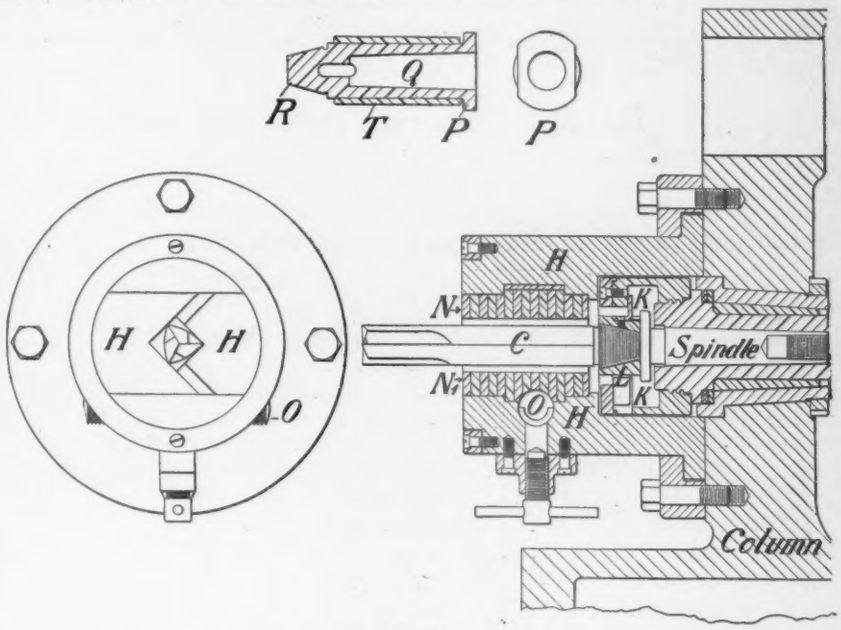


FIG. 2.

The cutter receives its motion from a special driving member which is fastened to the nose of the spindle. This driving member not only causes the cutter to rotate, but at the same time gives it freedom to travel eccentrically in the master guide. The whole arrangement for cutting square holes, simple in itself, is easily detached and the machine is ready for regular milling work or vice-versa.

Referring to Fig. 1 in the accompanying drawings, a side view is shown of the complete machine. (A) is the column with the main spindle bearing, (B) detachable chuck for cutting square holes, (C) the cutter, (D) special vise for holding work, and (E) a special brace connecting knee with overhanging arm and base. Fig. 2 shows an axial cross section through the square hole cutting arrangement, which latter consists mainly of two separate bodies, viz., the driving member (K), which is screwed to the nose of the spindle, and the stationary guiding chuck (H), which is bolted to the column over the main bearing. The driving member contains a floating driving dog (L), into which cutters (C) engage by means of a taper thread. Behind this dog is a floating thrust plate which takes up the end thrust of the drills. The stationary guiding chuck contains the master guide, which consists of two jaws (N) and (N_1), forming an adjustable square guiding hole, in which the drill (C) is forced to describe its particular cam motion. (O) is a right and left-hand screw for opening and closing these in accordance with the size of drill used. The range for boring square holes is from ¼ in. to 2 in.

For boring round holes in connection with the arrangement for cutting square holes the means employed are represented in the device above, Fig. 2, in which it will be seen that a round bushing (T) is inserted in the square guiding hole, and this

* A German machine for this purpose was illustrated in this Journal, January, 1909.

serves as a bearing for the shank (R), which contains a regular Morse taper (Q). This shank is fastened in the driving member by means of a taper thread (R), and describes a regular revolution inside the bushing (T). Any size twist drill can be inserted in the Morse cone and the whole arrangement is easily taken off.

It is evident that the installation of such a machine tool, which is always handy as a regular plain miller, will open new fields of manufacture and will be of value to every toolroom for special work of all kinds.

Recent Papers Presented Before The Railroad Clubs.

Some Recent Developments in Car Heating and Ventilation

CANADIAN RAILWAY CLUB.

The above subject is a most important one and it covers a very broad field. Therefore the excellent paper read by Lewis C. Ord, general car inspector, Angus shop of the Canadian Pacific Ry., was most appreciatively received by the membership of this club who were present at the October meeting. The paper was most interesting and reflected a deep study of the two subjects. From an instructive standpoint it adds greatly to the knowledge of these matters which railway men are now studying more than ever before, and which have also a direct appeal to the traveling public. The only competition the railroads recognize in passenger traffic to-day is their service, and the public have been awakened to the importance of good heating and good ventilation in relation to its comfort. The railroad which actually gives good ventilation and heating, and incidentally lets the public know about its efforts, will get the traffic, and thereby add to its revenue. The only way to obtain a thorough and satisfactory system in dealing with the dual question is to follow along the lines indicated by Mr. Ord in his valuable paper, and by others who are thoroughly, scientifically and practically investigating the subject in every detail, decide on what is required and then install the system which best appears to realize the ideal. The traveling public, as above stated, should know what is being done to secure their comfort and one-half of the present heard complaints will vanish. It was said during this meeting that the present appliances do not adequately take care of the situation, and it is encouraging to know that the subject is being given the amount of care and thought which Mr. Ord's paper indicates.

Tool Steel

NEW YORK RAILROAD CLUB.

The necessity of accurate control of the temperature at which steels of different carbon content are forged and annealed was a very interesting feature of a valuable paper read before this club on November 17 by W. B. Sullivan, of the Carpenter Steel Company, Philadelphia, Pa. It was pointed out that by a judicious application of heat it is possible to obtain almost any desired combination of ferrite, pearlite and martensite, and emphasis was laid on the fact that tools when properly handled should be heated first to the proper temperature or critical point before being quenched. Even at the proper temperature tools should not be allowed to soak too long, it was further explained, as this procedure tends to produce decarbonization on the surface.

The author pointed out that the hardness of a piece of steel, properly treated, is governed by the size and character of the steel and by the temperature and character of the bath. The conclusion reached, based on general principles, was that for small sections lower temperatures should be used than for large pieces. The degree of hardness is found to be dependent upon the rapidity with which the heat is extracted from the steel, and it is found that a bath of high temperature will produce less hardness. Tests made by the Carpenter Steel Company showed that, compared with water on a basis of unity, No. 1 mineral oil had a tempering quality of 0.241; cottonseed oil, 0.161, and fish oil, 0.149.

In his paper the author included an outline of the proper grades and tempers of carbon tool steel for various uses. Temper No. 1 contains 0.70 to 0.80 per cent. carbon; No. 2, 0.80 to 0.90 per cent. carbon; No. 3, 0.90 to 1 per cent. carbon; No. 4, 1 to 1.15 per cent. carbon; No. 5, 1.15 to 1.25 per cent. carbon. Grade A is the highest grade steel selling for about 16 cents per pound. Grade B sells for 13 cents per pound and Grade C for 10 cents per pound. Grade D is ordinary tool steel selling for about 7 cents per pound. The following outline shows the proper selection of temper and grade and the proper heat treatment:

Temper No. 1.	Grade.	
Crowbars	D	Should not be heated over 1,800 deg. Fahr. for forging. Hardens at 1,485 deg. Fahr. Temper drawn to suit character of work. Should be annealed at 1,300-1,350.
Pinchbars	D	
Pick Points	D	
Wrenches	D	
Sledges	C	
Hammers	C	
Rivet Sets	B	
Temper No. 2.		
Smith Tools	C	Should not be heated over 1,800 deg. Fahr. for forging. Hardens at 1,480 deg. Fahr. Temper drawn to suit character of work. Should be annealed at 1,300-1,350.
Track Tools	C	
Boilermakers' Tools	C	
Temper No. 3.		
Cold Chisels	C	Should not be heated over 1,750 deg. Fahr. for forging. Hardens at 1,465 deg. Fahr. Temper drawn to suit character of work. Should be annealed at 1,300-1,350.
Hot Chisels	C	
Rock Drills	C	
Shear Blades	B	
Punching Toools	B	
Temper No. 4.		
Machine Drills	B	Should not be heated over 1,700 deg. Fahr. for forging. Hardens at 1,460 deg. Fahr. Temper drawn to suit character of work. Should be annealed at 1,300-1,350.
Counter Bores	B	
Milling Cutters	B	
General Machine Shop Tools	B	
Carbon Lathe Tools	A	
Taps	A	
Dies	A	
Reamers	A	
Temper No. 5.		Should not be heated over 1,700 deg. Fahr. for forging. Hardens at 1,455 deg. Fahr. Temper drawn to suit character of work. Should be annealed at 1,300-1,350.
Brass Tools	A	
Finishing Tools	A	
Small Machine Shop Tools	A	

Scientific Management

NEW ENGLAND RAILROAD CLUB.

This club is to be congratulated on having secured a paper on the above subject by Frederick W. Taylor for presentation at its October meeting. The question has, of course, a direct bearing on railroad work because in many of its phases railroading suffers from very violent fluctuations in the demand for certain kinds of work. Mr. Taylor's paper may be regarded as an authoritative exposition of true scientific management. It was of particular value on this occasion as an important phase of the problem of the railroad manager was indicated by the extreme viewpoints of two speakers, that is, the idealistic viewpoint of the originator of scientific management and the frankly obstructive attitude of Mr. T. A. Connor, who represents the machinists' labor unions. Professor W. J. Cunningham believed that somewhere between these two extreme views must be found a neutral ground. He mentioned, following his experience in studying at first hand conditions on the Santa Fe where scientific management is employed, that the latter as elucidated by

Mr. Taylor is not in effect on that system, but rather a compromise between it and that of other efficiency experts. It was pronounced as in possession of virtues as well as defects, but the speaker's observations led him to believe that shop men, foremen and superintendents were all enthusiastic over the results, although the same enthusiasm was not apparent in other branches of the service. The paper was very favorably received by the members in general, and its careful perusal is recommended to those interested.

Engine Failures

NORTHERN RAILWAY CLUB.

This paper was presented before the above club at the October meeting. In view of the fact that it was prepared by a traveling engineer, Nels Osgard, of the Great Northern Ry. at Superior, Wis., it attracted a considerable attendance and was accorded the thorough discussion which the subject, although somewhat hackneyed, generally inspires. During his remarks Mr. Osgard opined that much carelessness is present in looking over the reports that are made of work to be done in the roundhouse, and expressed himself as satisfied that in many cases half the reported work is overlooked, due to not having force enough to take care. Mr. Seddon, speaking from the roundhouse viewpoint, stated in four or five years as foreman of that department he had not let an engine out until positive the same was O. K., and so it goes. There is no doubt but that the general subject of engine failures will always remain of very great importance, and papers thereon when discussed with the interest displayed at this meeting are valuable in conveying the experiences of others in combating the varying features of the problem. The subject is commented at some length elsewhere in this issue.

The Distribution of Instructions and Information in Large Industries

CENTRAL RAILWAY CLUB.

The November meeting of this club was signalized by the reading of a most interesting paper on the above subject by F. M. Whyte. In it the author pointed out that as organizations increase in size the difficulty becomes more apparent to harmonize by instructions and information, the various elements of the organizations to one main idea, or to the ideas of one man, or a group of men. In the consideration of methods which might be employed to bring this about the paper mentioned the distribution of detail information through standards, through circulars, and particularly through traveling representatives.

PERSONALS

W. H. DONLEY succeeds F. G. Colwell as master mechanic of the Illinois Central R. R. at E. St. Louis, Ill.

R. D. MALLOY succeeds Edward Wees as general foreman of the Pere Marquette Ry. at Frankfort, Mich.

H. F. CAMPBELL has been made general foreman at Chattanooga, Alabama Great Southern Ry., succeeding H. B. Hayes, promoted.

W. P. HOBSON has been appointed superintendent of motive power on the Chesapeake & Ohio Ry., succeeding W. T. Smith, retired.

H. A. UHLER has been appointed road foreman of engines on the National Railways of Mexico, with office at Monterey, Mexico.

T. F. DREYFUS has been appointed master mechanic of the Baltimore & Ohio R. R., with office at Benwood, W. Va., succeeding D. H. Speakman.

A. S. HOWE has been appointed superintendent of motive power of the Nevada, California, Oregon Ry., to succeed W. D. Gardner. Mr. Howe's office will be at Reno, Nev.

JOHN BURNS has been appointed master mechanic of the Eastern division of the Canadian Pacific Ry., vice J. B. Elliott, retired. The office is at Montreal, Que.

CHARLES J. SCUDDER, master mechanic of the Pere Marquette R. R., at Saginaw, Mich., has resigned to take a position as district boiler inspector with the Interstate Commerce Commission.

W. L. KELLOGG, superintendent of motive power of the Cincinnati, Hamilton & Dayton Ry., has been appointed in a similar capacity on the Pere Marquette Ry., with office at Detroit, Mich.

H. H. HALE has been appointed superintendent of motive power of the Cincinnati, Hamilton & Dayton Ry. at Cincinnati, O., succeeding W. L. Kellogg.

H. B. HAYES has been made master mechanic of the Alabama Great Southern Ry. at Birmingham, Ala., vice Joseph Quigley, appointed master mechanic of the Queen & Crescent Ry. at Ferguson, Ky., vice F. O. Sechrist, resigned.

BRUCE W. BENEDICT, for several years in the motive power department of the Atchison, Topeka & Santa Fe Railway, has been appointed Director of the Shop Laboratories in the Department of Mechanical Engineering at the University of Illinois.

W. C. STEARS, master mechanic of the Lima district of the Cincinnati, Hamilton & Dayton Ry., with office at Lima, Ohio, has been appointed master mechanic of the Indianapolis and Springfield divisions of the same road, with office at Moorefield, Ind., succeeding F. C. Pickard, who resigned to take a position with the Pere Marquette R. R.

CATALOGS

BLOW-OFF VALVES.—A booklet illustrating and describing the Nelson blow-off valve is being distributed by the Nelson Valve Co., Philadelphia, Pa. The booklet is thoroughly explanatory of the well-known appliances and contains several important items of information for those in charge of their operation and maintenance.

ELECTRICAL EQUIPMENT.—The General Electric Company, of Schenectady, N. Y., in Bulletins Nos. 4883, 4886, 4891 and 4892, respectively, describe the Curtis Steam Turbine Generator, electricity in coal mines, electric railway equipment, and the battery truck crane. These bulletins are presented in the usual attractive form which characterizes all of the literature issued by this company, and each constitutes practically the last word on the subject to which it refers.

LOCOMOTIVE SUPERHEATERS.—"The Application of Superheated Steam to the Locomotive" is the title of a most instructive pamphlet published by the Locomotive Superheater Company of 30 Church St., New York, N. Y. The historical aspect of the device is considered and the text elaborates on the general construction of the Schmidt superheater, which is now applied to about 9,000 locomotives, operating on more than 200 railroads. The book also includes tabulated records of some very interesting tests which afford data of much value.

ASBESTOS SHINGLES.—A general description of J-M transite asbestos shingles is presented in a booklet issued by the H. W. Johns-Manville Co., and their striking advantages over other types of roofing material for buildings are pointed out. In view of the fact that five underwriters and municipal authorities are establishing stringent requirements in building construction at this time the indestructibility and fire proofing qualities of these asbestos shingles become of particular interest. The catalog is profusely illustrated with photographs of buildings installed with the material, and contains considerable descriptive matter concerning its application.

STEEL SHAPES.—The new "Shape Book" just issued by the Carnegie Steel Company, with a few unimportant exceptions, contains profiles of all the sections rolled on the structural, plate, bar and rail mills of that company, together with tables and other data in regard to these products. It supersedes and cancels the book of shapes issued in 1903, together with all supplements thereto. The present issue is a substantial book of 256 pages, 5 by 7½ in., and is in the usual handsomely bound form of those which have preceded it. The data tables in connection with the illustrations have been compiled with great care and afford a fund of inexhaustible information for those interested in the general subject of steel shapes.

STEAM ACETYLENE GENERATORS.—The Alexander Milburn Company, of Baltimore, Md., manufacturers of the Alexander steam acetylene generator, has issued a very attractive catalog illustrating and describing the device. The problem of lighting headlights is now seriously engaging the attention of railroads and the device is of special interest at this time. It is the newest in generating acetylene gas for this purpose, using steam from the locomotive for the purpose. Any pressure of steam from as low as half a pound to as high as 200 pounds will work satisfactorily, hence exhaust steam can be employed, the quantity in any case being practically negligible. The catalog will repay a perusal by all interested in the subject of acetylene lighting for headlights, railroad coaches, steam yachts, or other requirements.

HEATING, FORGING AND WELDING FURNACES.—These appliances are treated at considerable length in a handsomely illustrated catalog of 32 pages just issued by Tate, Jones & Co., engineers and manufacturers, of Pittsburgh, Pa. The furnaces manufactured by this firm for the above purposes use either oil or gas fuel and may be run at their full capacity. As illustrated and described in the pages of the catalog, the assurance is conveyed that these furnacs will do the work more thoroughly, more expeditiously and more economically than the usual makeshifts, because they are not merely haphazard assemblies of cast iron and brick, but, on the contrary, are successful designs, founded on mechanical and metallurgical theory supported by many years of practical experience in oil and gas furnace building.

LOCOMOTIVE COALING STATIONS.—The Roberts and Schaeffer Co., engineers and contractors, of Chicago, Ill., in a very artistic, recently issued catalog, portray most effectively the merits of the Holmen locomotive coaling station. The plan employed in the presentation of this matter was to graphically impress through photographs of various installations the gneral utility of the structure, and the varying range of work of which it is capable. In this the compiler has succeeded admirably, as in the catalog no less than twenty-five coaling stations from as many roads are illustrated, each of which is annotated with the proper descriptive text. As the illustrations depict practically all possible conditions which might be encountered in connection with the installation of coaling stations, this catalog must be of pronounced value to those charged with the consideration of such problems.

BOX FRAME INTERPOLE RAILWAY MOTORS.—Descriptive Leaflet 2373, issued by the Westinghouse Electric and Manufacturing Company of East Pittsburgh, Pa., describes the No. 303-A box frame interpole motor manufactured by that company. Complete specifications for the motor, brief descriptions of the important parts, and performance curves are given on the sheet. Particular stress is laid upon the fact that the motor is equipped with axle-bearing dust guards, which prevent the entrance of dirt and sand into the axle bearings, and thereby greatly prolong the life of bearings and gears. The leaflet is 8½ x 11 inches, so that it readily binds in with the usual letter size sheets. Descriptive Leaflet 2374, recently issued by the same company, gives specifications and brief descriptions of the parts of that company's box frame interpole railway motor No. 310-C. This leaflet is similar in general make-up to the one above described.

STEAM DRIVEN COMPRESSORS.—The Ingersoll-Rand Co., 11 Broadway, New York City, have issued a new catalog, Form 3211, bulletin of 20 pages, descriptive of "Imperial Type X" duplex steam driven compressors. The catalog shows several views of the machine in section, and gives tables of standard sizes and capacities. These machines have massive, well-braced structure, unusually generous bearing surfaces, mechanically actuated air intake valves with large, direct passages, and cushioned discharge valves. The air cylinders of all "Imperial" compressors have water-jacketed barrels and heads, the latter being hooded for the admission of cool, clean air. The smaller compressors, up to 16 in. stroke, have overhung cylinders. On larger sizes the air cylinders are supported on a strong foot-piece resting upon a sole-plate on the foundation, and may be slid away on this sole-plate when it is necessary to detach the cylinder from the frame.

SILENT CHAIN DRIVER.—In a well and appropriately illustrated booklet the Morse Chain Company, of Ithaca, N. Y., invites attention to a drive which is no longer experimental, but rather a distinct advancement in power transmission. It is worthy of consideration for almost any amount of power that may be required to be transmitted. The design and operation is clearly portrayed and described in the catalog, and the descriptive matter embodies a very interesting comparison between a 1,200 horsepower rope and an equal power chain drive in which the advantage and the economy of the latter is clearly demonstrated. The improved "Silent Chain" may be considered as a flexible rack, designed to keep automatically in proper pitch contact with the sprockets. It has a certain amount of elasticity due to the arch shaped links, and thus, to a greater or less extent, is driving through an elastic medium without shock or noise, a feature which makes it most desirable for general power transmission purposes.

POWER TRANSMISSION MACHINERY.—This is the title of the latest catalog issued by the Jeffrey Manufacturing Co., of Columbus, O., one which is probably the most complete and up-to-date in existence. There are more subjects listed and there is more technical and real information thereon in this book than in any similar publication which has come under our notice. Besides listing dimensions and sizes of every part in this line, there is descriptive matter on the horsepowers of steel shafting, standard methods of key-seating, sizes and dimensions of couplings, hangers, pillow blocks, counter shafts, belt tighteners, clutches and quills. A feature is made of the Jeffrey improved split iron pulley, which may be readily clamped on the shaft without disturbing any other equipment, or may be easily removed when necessary. There are quite a number of details toward the end of the book, including horsepower of belts, method of calculating bending and torsional moments of shafts, etc., which are invaluable to the engineering fraternity.

CAR HEATING AND VENTILATION.—Burton W. Mudge & Co., of Chicago, Ill., have issued a very interesting and instructive catalog describing and illustrating the Garland heated and ventilated refrigerator car The subjects of ventilation, refrigeration and heating are treated separately and in detail, and the advantages accruing from the use of the Garland system are clearly set forth. This latter comprises a complete arrangement of ventilators and air intakes that keep a good circulation of fresh air passing through the car and lading. A perfected plan of refrigeration whereby the ice water from the ice tanks is made to circulate through pipes under the load instead of being discharged direct to the outside. The cold units in the ice water are therefore utilized and made to aid in the refrigeration of the car before the water is allowed to escape. A material saving in ice is therefore effected. During cold weather steam is supplied to the car from the engine, yard steam plug or other source and contents of cars is fully protected from frost.

RAILROAD SUPPLIES.—The railroad department of the H. W. Johns-Manville Co., 100 William Street, New York City, is distributing a new 350-page catalog—No. 252—which illustrates, describes and lists in an unusually attractive way, their vast line of products supplied to steam railroads. Among the products shown, most of which are made of asbestos, magnesia or indurated fibre, we note pipe and boiler coverings, packings, cements, roofings, waterproofing materials, heat, cold, sound and electrical insulators, transite smoke jacks, transite asbestos wood, ceilinite insulation, conduit for pipes or wires, fuses, linolite electric lamps and accessories. The careful and systematic arrangement of the products to facilitate selecting and ordering them, the thorough indexing of material and the great amount of valuable data included, make this volume a veritable encyclopedia on the subject of steam railroad supplies. A comparison of this catalog with the preceding edition published three years ago, indicates by the greater number of products listed, more forcibly than words could do, the remarkable growth of the railroad department of this company.

ROCK DRILLS.—The Ingersoll-Rand Co., 11 Broadway, New York City, have a new catalog, Form 4003, bulletin of 16 pages on "Little Giant" rock drills. The catalog shows the machine in section, and gives views of machines at work on the Panama Canal, etc. The distinctive characteristic of this tappet rock drill is the positive character of its valve movement. There being direct mechanical connection between valve and drill piston, when steam or air is admitted to the cylinder, the piston must move; and when the piston moves, the valve must be thrown, so that the operation of the drill is a certainty. The valve movement consists of three pieces: a valve, a rocker and a rocker pin. The rocker turns on the rocker pin and is so arranged that one or the other of its lower members is always in contact with the piston. Its upper member, ending in a globular shape, projects into the valve. When the piston moves, a curved surface slides under one of the rocker contacts, pushing the rocker upward and swinging the valve in the same direction as the piston is moving. On the reverse travel of the piston, this series of movements is exactly reversed. The throw of the valve covers and uncovers the supply and exhaust ports. The catalog gives a descriptive table of "Little Giant" Drills showing sizes and principal dimensions.

NOTES

TRIUMPH ELECTRIC COMPANY.—This company of Cincinnati, O., has recently opened a district office at No. 2219 Farmers' Bank Bldg., Pittsburgh. Formerly they were represented by the Doubleday-Hill Electric Company in that territory, but the rapidly increasing business made it seem advisable to have direct representation in this important center. D. D. Gill will be in charge of the new office.

JERGUSON MANUFACTURING CO.—Announcement is made by the above company of Boston, Mass., that the Joseph M. Brown Company will be the representatives for the Jerguson Manufacturing Company in the states of Illinois, Missouri, Minnesota and Michigan for Klinger type water gauges and spare glasses, and also that the Dravo-Doyle Company will represent the Jerguson Manufacturing Company in the states of Pennsylvania, Ohio, Maryland, Delaware and West Virginia for the same appliances.

BEST MANUFACTURING CO.—This company of Pittsburgh, Pa., announces that Charles E. Hague has been appointed as Philadelphia representative with headquarters at 1510 Land Title Building. He is to have charge of Eastern Pennsylvania, Baltimore and Washington territory. C. L. Stickney and Co. have also been appointed to represent the Best Mfg. Co. in the states of Washington and Oregon, with headquarters at 108 White Building, Seattle, Wash.

REMY ELECTRIC CO.—This company of Anderson, Ind., which recently absorbed the American Electric Headlight Co. and now makes the American electric headlight for steam locomotives, has purchased outright all patents, designs, good will and manufacturing rights of the Peters electric headlight. This department of the R. G. Peters Co., of Grand Rapids, Mich., has been moved to Anderson, and the Peters light will be owned, manufactured and sold by the Remy company. This absorption makes the latter the world's largest makers of locomotive electric headlights. The great demand for these within the past few years has been the cause of the Remy company entering the field on so large a scale, and its extensive facilities, together with advanced methods of manufacturing, guarantees the very best possible workmanship on the new devices.